THE FOUNDRY

wherever metals are cast...

GIANT

MIDGET or

If it's a MOLDER MILWAUKEE CAN MAKE IT!

MIDGET MILWAUKEE
Jolt Squeezer
with 10" squeeze piston.

MILWAUKEE Molding Machines, Core Blowers and Core Grinders are built in various sizes to meet the needs of the industry. Every machine is designed by practical, seasoned foundrymen, familiar with all phases of the foundry industry . . . pattern making . . . engineering . . . foundry operation, etc. If you have a molding or core making problem, consult a Milwaukee Foundry engineer. He will gladly give you the benefit of his broad experience.

CORE BLOWERS • CORE GRINDERS MOLDING MACHINES • BRIQUETTING PRESSES

MILWAUKEE Foundry Equipment Co.

3238 W. PIERCE STREET, MILWAUKEE 4, WISCONSIN, U.S.A.

Accused of trying to sell stones for fuel, the first vendor of anthracite coal in Philadelphia had to sell two wagon loads at cost, give away five others.
Barton

"ANTHRACITE FOR FURNACE FUEL?"

"NEVER!" said the iron makers of 1812

Even with important advantages over charcoal, anthracite needed 28 years for wide acceptance by iron makers. First offered in 1812, it wasn't until 1840 that Dr. Geissenhainer's principle of using anthracite with a hot blast was generally accepted. By 1890, the industry was producing 2,186,411 tons of anthracite iron a year.

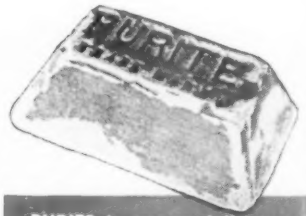
In striking similarity was the reception given to PURITE. Placed on the market only 25 years ago, PURITE is now employed in the production of over 10,000,000 tons of castings annually. Here is why:

PURITE forms a sodium slag which is more fluid, more highly basic and of lighter gravity than ordinary cupola slags. This slag not only fluxes the cupola better, resulting in improved melting conditions, but converts particles of slag-oxides entrained in the iron into a liquid form, which frees itself from the molten metal. The result is cleaner iron and better castings

For the facts on improved quality and lower operating costs, send for details about PURITE. Mathieson Chemical Corporation, 60 East 42nd Street, New York 17, N. Y.

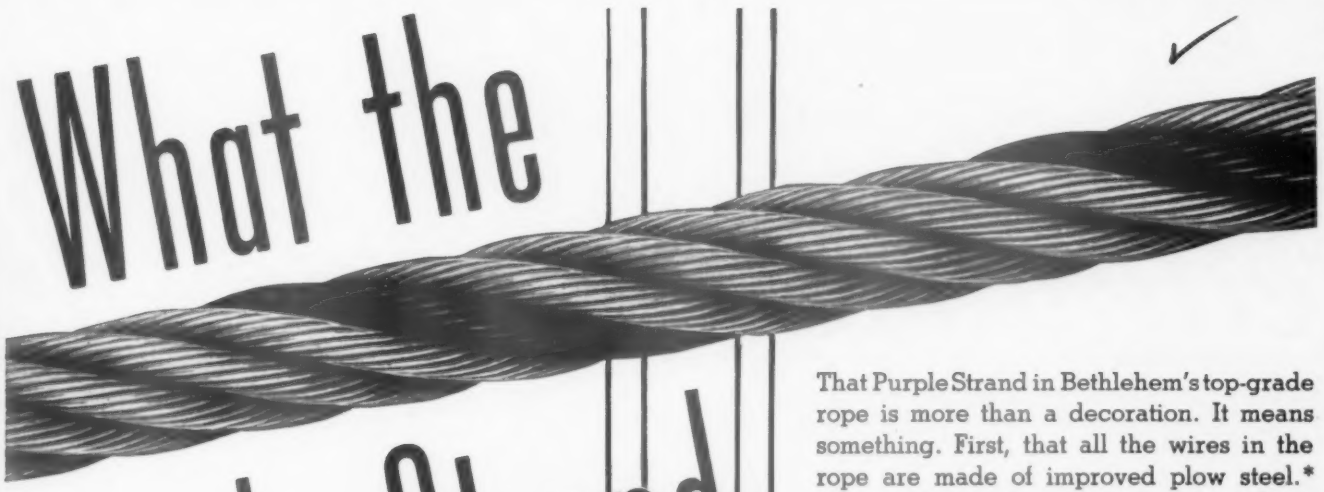
Mathieson
PURITE

Purite (Fused Soda Ash) . . . Liquid Chlorine
Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Ammonia, Anhydrous & Aqua
Sodium Chlorite Products . . . Chlorine Dioxide
HTH Products . . . Dry Ice . . . Carbonic Gas
Sodium Methylate



PURITE is commercially pure soda ash containing over 98% sodium carbonate, fused and cast into convenient 2-lb. pigs. Its desulfurizing and refining action are traceable to the chemistry of soda ash.

What the Purple Strand means



That Purple Strand in Bethlehem's top-grade rope is more than a decoration. It means something. First, that all the wires in the rope are made of improved plow steel.* Second, that you're going to get a lot of fine service from the rope. Long life, worry-free performance.

When you need new lines for your cranes and hoists, don't just order "more wire rope." Call the Bethlehem distributor nearest you; ask for Bethlehem Purple Strand by name. It's a strong, durable rope that will easily handle your heaviest foundry loads.

*Improved plow is the toughest grade of steel that ever goes into the making of rope.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

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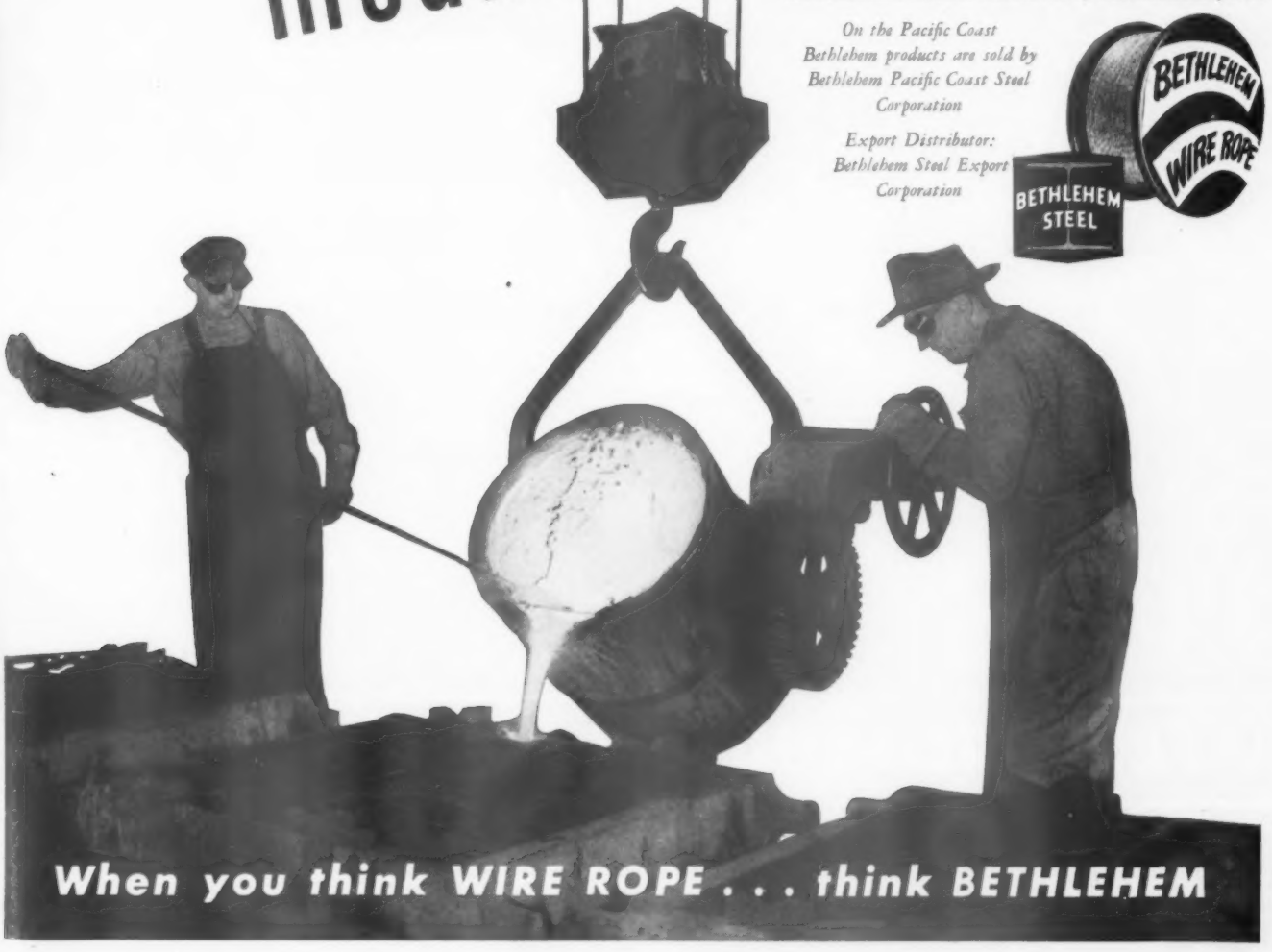

When you think WIRE ROPE . . . think BETHLEHEM

A GOOD PRODUCT SPEAKS FOR ITSELF

Federal Green Bond

SAYS:

"I CONTROL SAND STRENGTH.
I CAN MAKE SAND FIRM AND
STABLE, OR I CAN MAKE IT
SO IT COLLAPSES READILY.
I NEVER VARY IN PER-
FORMANCE OR QUALITY.
I AM ALWAYS DEPENDABLE.
I AM THE BEST
WYOMING BENTONITE."

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

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AUGUST, 1948

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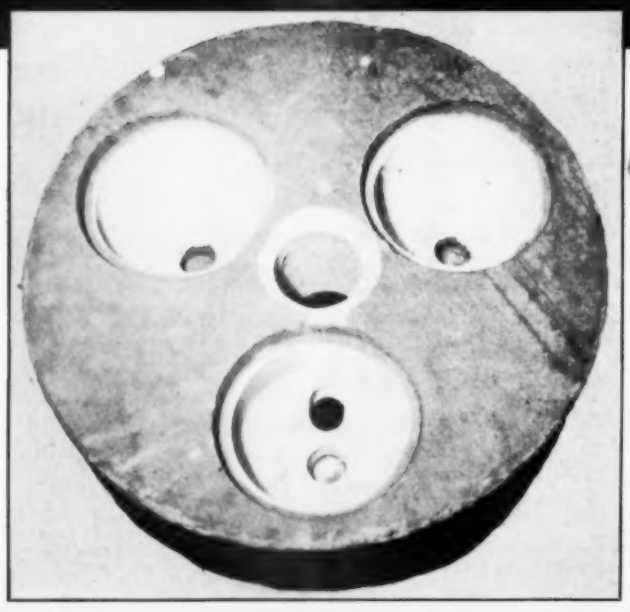
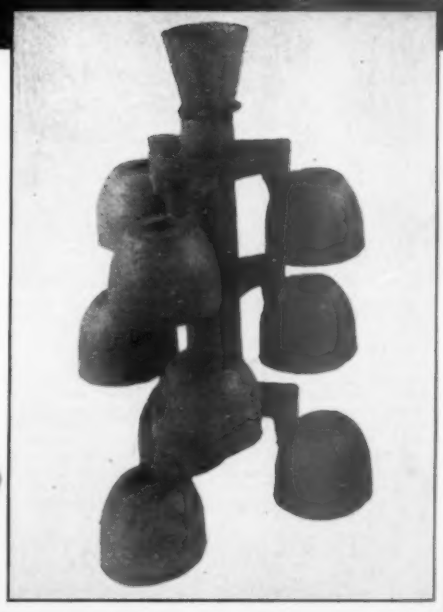
HOW LINOIL CORES AID

Pouring on a centrifugal "spinner". The adjacent mold doors are left open to reveal its construction.



A Centrifugal core. Three castings are poured simultaneously in this core, and several additional cores are stacked on top of it.

The casting "tree" that results. Notice high yield. 9 castings are poured on the floor space for one mold.



D IN CENTRIFUGAL CASTING

THE YOUNGSTOWN ALLOY CASTING CORPORATION · YOUNGSTOWN, OHIO

Centrifugal casting represents a new twist in foundry practice that offers many advantages. The main attraction is higher yield—since heavy risering can be substantially reduced. However, closer tolerances, smoother finish, faster and cheaper cleaning, and increased production—over green sand methods—are also attained.

Centrifugal castings are poured in LINOIL-bonded dry sand molds on a revolving disk, or "spinner". Only one grade of sand is used—a high silica, subangular, Portage sand, AFA fineness 48 - 51. The initial cost of dry sand is a little higher than in green sand, but greatly offset by the savings in cleaning costs. Core production is more flexible—since standardized core molds can be stock-piled in advance, ready for pouring at any time. Smoother surfaces, impervious to erosion—eliminate holes, scabs, sand inclusions, and the need for patching expense. Closer tolerances are possible in dry sand—reducing machining costs. Another important advantage of centrifugal casting is that of multiple molding—from 2 to 160 castings can be poured on the floor space occupied by one mold.

Successful results in centrifugal casting hinge primarily upon dependable core performance. LINOIL'S strong binding strength . . . core hardness . . . low gas content . . . and its un-hindered collapsibility—uniform characteristics at all times—assure the Youngstown Alloy Casting Corp., of consistent casting success.

THE LINOIL — THE LOGICAL OIL

WERNER G. SMITH COMPANY

(DIVISION OF ARCHER-DANIELS-MIDLAND COMPANY)

2191 WEST 110th STREET · CLEVELAND 2, OHIO

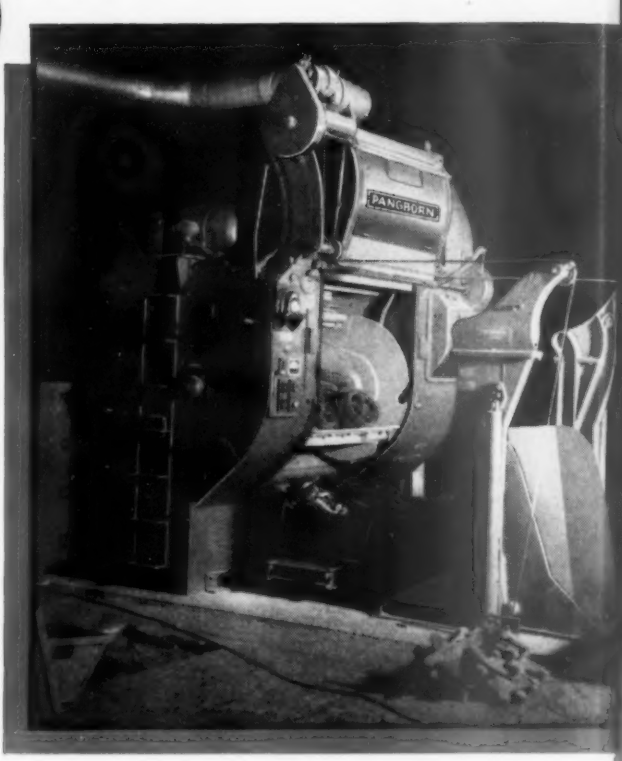
Equipment for Every Job . . .

Pangborn ROTOBLAST *Barrels*

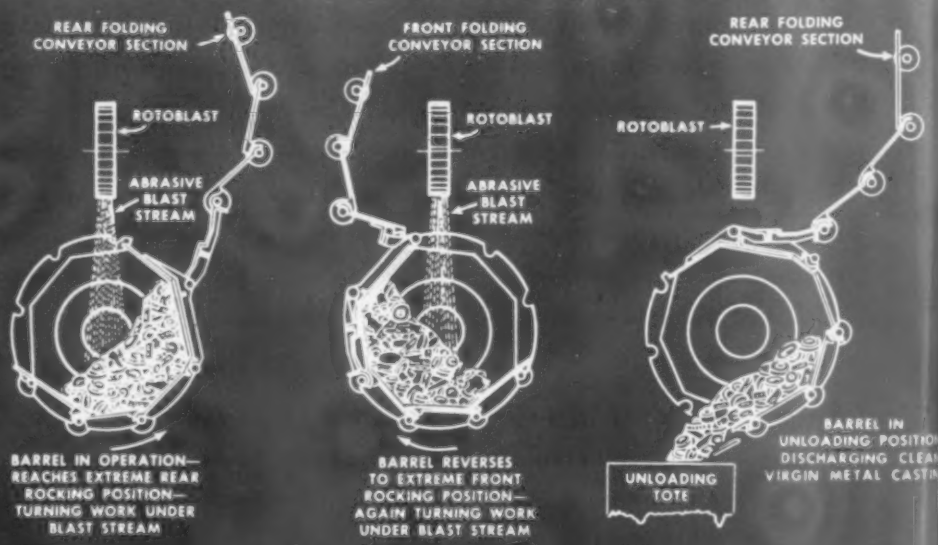
Current users of Pangborn ROTOBLAST Barrels report enthusiastically the savings in man-hours, the increase in cleaning output, the improved consistent uniformity of cleaning, and drastically cut over-all cleaning costs that are directly traceable to these machines. The exclusive design feature of Pangborn Rocking Action has proved to be an efficient way of completely turning work, as well as untangling shapes that tend to interlock or "nest."

AVAILABLE IN CAPACITIES OF 3½, 7, 14, 17½, 21, 28 CUBIC FEET

WRITE TODAY for information on all Pangborn Blast Cleaning and Dust Control Equipment. Address: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland.



HERE'S HOW PANGBORN EXCLUSIVE ROCKING ACTION TURNS OUT PRODUCTION


REAR FOLDING CONVEYOR SECTION
ROTOBLAST
ABRASIVE BLAST STREAM
BARREL IN OPERATION— REACHES EXTREME REAR ROCKING POSITION— TURNING WORK UNDER BLAST STREAM
FRONT FOLDING CONVEYOR SECTION
ROTOBLAST
ABRASIVE BLAST STREAM
BARREL REVERSES TO EXTREME FRONT ROCKING POSITION— AGAIN TURNING WORK UNDER BLAST STREAM
REAR FOLDING CONVEYOR SECTION
ROTOBLAST
UNLOADING TOTE
BARREL IN UNLOADING POSITION DISCHARGING CLEAN VIRGIN METAL CASTIN

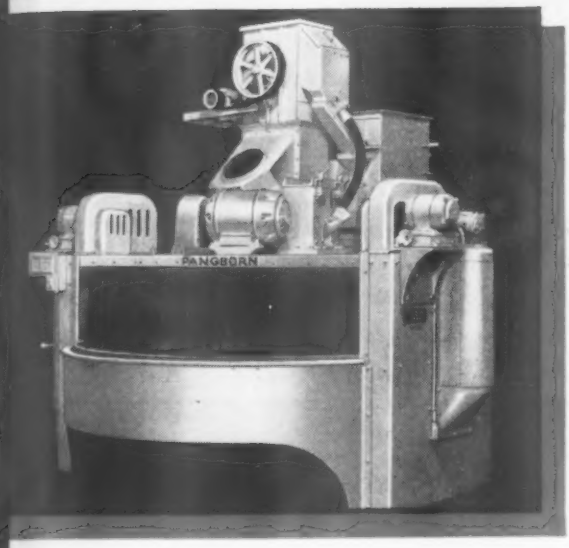
BLAST CLEANS CHEAPER

with the right equipment for every job

Whatever Your Blast Cleaning Problem

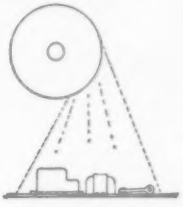
PANGBORN Has the Right

Pangborn ROTOBLAST Tables



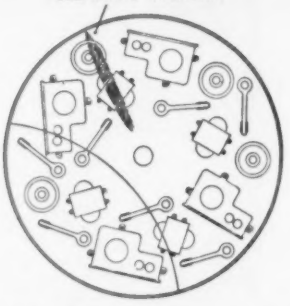
TYPE "LF"

One of the two basic type Pangborn ROTOBLAST Tables is this model "LF" Single Type Standard Table Installation. Work is placed on the Table level, passing through the blast stream in fixed position as the Table rotates. The ROTOBLAST stream, thrown at 90° to the plane of the work, permits pieces to be placed close together on the Table due to the concentration of the stream and greater target area presented by the work.

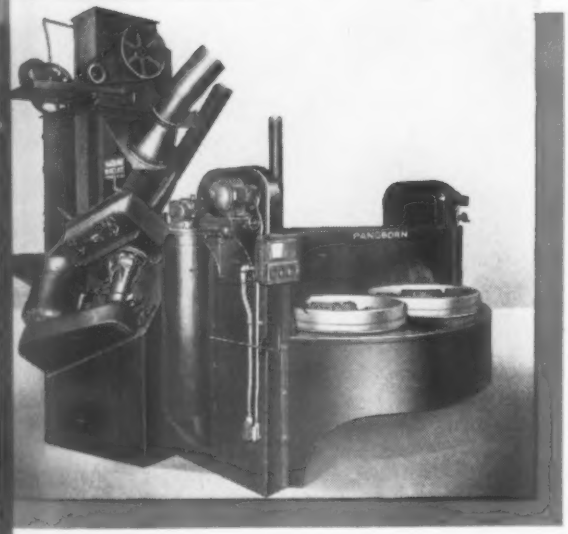


BLAST STREAM AT 90° ANGLE

CLEANING PATTERN

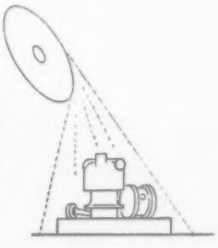


Here is production blast cleaning of high efficiency for flat-surfaced work. Faster, cheaper, cleaner is the Pangborn method, meeting the ever-changing demands of industry. This type machine offers full freedom to the operator, outside of the blast-cleaning enclosure. It permits full use of modern devices for material handling. One user, the Florence-Wehrle Stove Co., Newark, Ohio, states, "Our 8 foot Pangborn Standard ROTOBLAST Table enables us to clean 3,000 pounds of green ware, 1,600 pounds of enamelware and 700 pounds of de-enameling per hour."



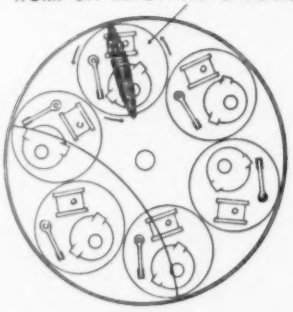
TYPE "LG"

The Pangborn "LG" has the added advantage of Auxiliary Work Tables. As these Tables pass through the ROTOBLAST stream on the Main Table orbit, they revolve around their own independent axels and bring all exposed surfaces (horizontal and vertical) into direct impingement with the blast stream, resulting in thorough, uniform cleaning.



BLAST STREAM AT 45° ANGLE SPINDLE REVOLVES IN STREAM

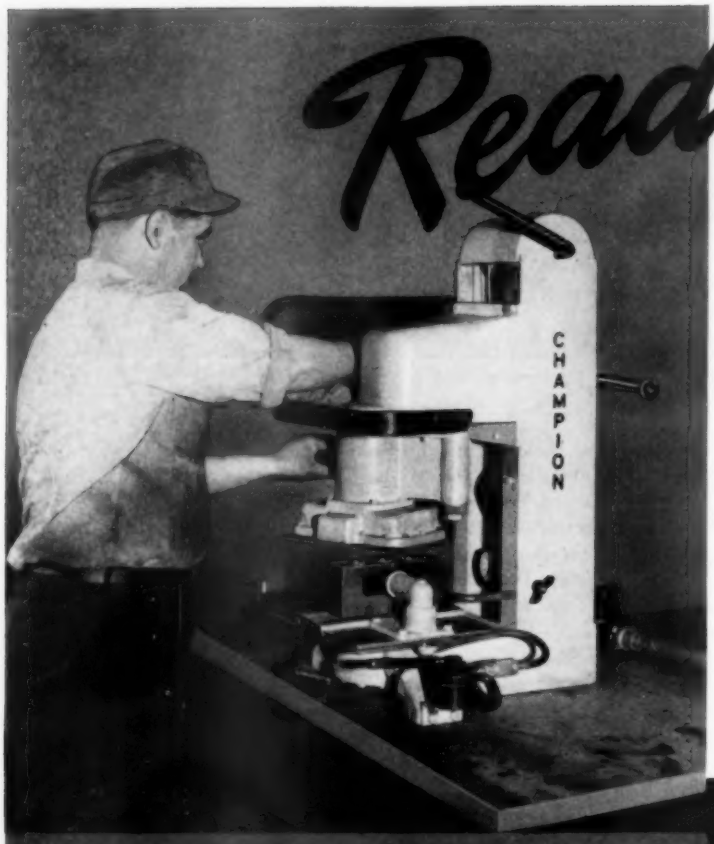
WORK ON REVOLVING SPINDLES



For outstanding performance in cleaning work with deep pockets, intricate contours, and multisurfaces, this design Pangborn "LG" Type ROTOBLAST Table is excellent. Since the blast stream is hurled at 45° to the plane of the Table, and the Auxiliary Work Tables rotate beneath it, all exposed surfaces are quickly cleaned down to virgin metal. Another Pangborn user, a large heater manufacturer, cleans heavy, intricate castings at the rate of 40-50 tons in a 7½ hour day using a Pangborn "LG" Table.

PANGBORN TABLES ARE AVAILABLE IN DIAMETERS OF 6, 9, 10, 12, 15 FEET

Pangborn



Ready to Go!

"JUNIOR"

LIKE ALL CHAMPION CORE BLOWERS IS A

COMPLETE MACHINE!

Sand, air and core boxes are all you have to supply to put a Champion "Junior" core-blower into operation. As soon as you uncrate the machine, put sand in the hopper and connect the air, you are ready to begin blowing cores of top quality . . . *and fast!* Air pressure of 85 pounds is ample to produce a perfectly satisfactory core; no need of boosters or other special equipment.

SEE HOW SIMPLE IT IS TO OPERATE

First, swing the magazine to the left to fill with sand, then back into position. Next give the air lever a twist to right and back. As fast as that you have filled every nook and cranny of your core box with well rammed sand. The core is ready to take out.

Clamping the two halves of a vertically split box together, clamping box against blow plate and filling the box altogether takes only a fraction of a second!

CB-400 Blowing sectional cores for industrial Diesel engine castings.

HOW BIG DO YOU GO---?

Champion Core Blowers, in six sizes, ranging from the CB-5 (Junior) up to the CB-400, provide for the widest range of core blowing requirements. And from the smallest to the largest, every one is a Champion in speed, easy operation, uniform quality production and overall economy.

QUICK INTERCHANGE!

One of the biggest advantages of the Champion "Junior" is the provision for rapid change over. Short runs are produced just as economically as long, because getting ready is a matter of mere seconds. No tools or wrenches are needed. No bolts or latches need be loosened or tightened.

Blow plate and base plate are removed and replaced in an instant! Box clamps are spaced to receive any box with a few quick spins of the handles.

LARGE RETURNS ON SMALL SPACE · · · SMALL INVESTMENT!

You can place a "Junior" core blower just about anywhere. It takes up no more room than a man making cores by hand. And for a nominal investment it will multiply his production many times.

Every Shop can use a "JUNIOR" *Profitably!*

Even on short runs, it pays to be sure of cores that are uniform in quality and produced at the lowest cost. The "Junior" fits in there because there is practically no set up time involved. On long runs the advantages and savings are even more substantial.

Why not You-too--? Why not NOW?

Let us show you how easy it is to adopt the Champion method—how quickly you can begin reaping the benefits of installing Champion equipment. Write us, today.

OR IS IT MOLDS THAT WORRY YOU?

Champion molding machines, jolt squeezers, rollover and draw machines have the high productive capacity, the precision and ease of operation that make the big difference in profitable production. There's a place in any up-to-date foundry for Champion equipment. Let us show you what these efficient machines can do *for you.*

CHAMPION FOUNDRY & MACHINE CO.

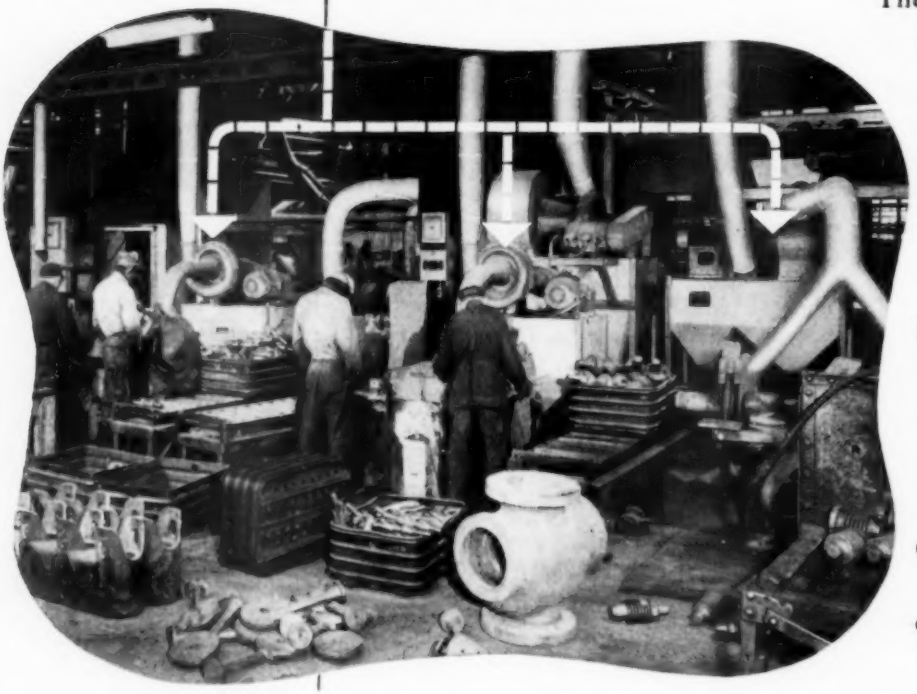
GENERAL OFFICE AND PLANT, ROCKFORD, ILLINOIS
SALES OFFICE: 1553 W. MADISON ST., CHICAGO 7, ILL.

MOLDING MACHINES — CORE BLOWERS
ELECTRIC RIDDLES

Heavy foundry snagging without visible dust

TYPE D ROTO-CLONE offers positive dust control on heavy duty grinding operations

TAKE a close look at this job. Four operators are busily engaged snagging steel castings. It's a high dust-producing operation, yet the atmosphere surrounding these machines is clear and clean. That's the result of Roto-Clone* Dust Control, which in this case consists of four Type D units.



The Type D Roto-Clone is a high efficiency dynamic dust precipitator combining the functions of exhauster and separator in a compact, self-contained unit. One moving part—the impeller—draws in the dust-laden air, separates the dust, delivers the collected material to storage hopper and expels the clean air. Collection efficiency remains constant regardless of changes in air volume or operating speeds.

A Type D Roto-Clone Dust Control System may be installed as a central type with main duct and branch connections or, as in this case, individual units serving a single dust-producing operation. For complete information, call your local AAF representative or write direct to—

MEMBER FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION, INC.

AMERICAN AIR FILTER COMPANY, INC.
266 Central Ave., Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT

**Roto-Clone is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

Research Leadership back of every Ingot

Quality Ingot is your assurance of Quality Castings

Apex intense search—and research—for improved alloys give you the quality Alloys That Are Best By Test—from Ingot to Casting.

Apex Smelting Company

Chicago • Cleveland

2537 WEST TAYLOR STREET, CHICAGO 12, ILLINOIS
6700 GRANT AVENUE, CLEVELAND 5, OHIO

Read this STATEMENT of FACTS

MORE DELTA PERMI-BOND* IS USED BY FOUNDRIES IN ONLY *ONE* MID-WESTERN CITY THAN THE COMBINED TOTAL OF *ALL* SUBSTITUTE PRODUCTS USED BY FOUNDRIES ALL OVER AMERICA!

WHAT THESE FACTS MEAN TO *You* IN YOUR FOUNDRY

DELTA PERMI-BOND is a specially prepared pure hydrocarbon, completely volatile at elevated temperatures. It decomposes to form a vapor-gas cushion, which is reducing in nature, and leaves only a trace (two tenths of 1% maximum) of ash.

NINE IMPORTANT ADVANTAGES

1. Always uniform. Manufactured under rigid chemical and physical control.
2. Eliminates ash and free carbon which contaminate your sand.
3. Greatly reduces gas, smoke, soot and dirt in the foundry.
4. Provides correct amount of vapor gas in the mold cavity which allows use of lower permeability sand without casting blows.
5. Increases dry strength properties of sand.
6. Prevents scabbing, buckling, rat-tailing and cutting, greatly reducing scrap castings.
7. Improves casting finish . . . cuts cleaning room costs to a minimum.
8. More economical to use; cuts sand costs.
9. Much cleaner, more foolproof than seacoal.

Do not confuse DELTA PERMI-BOND with other sand additives or so-called "chemical sand-coating" cure-alls which may consist mainly of asphalt, or other petroleum by-product pitches dissolved in fuel oil or other solvents. DELTA PERMI-BOND is a scientific development protected by United States patents allowed.

Ask for a liberal working sample for test purposes. You will also receive complete instructions for use.

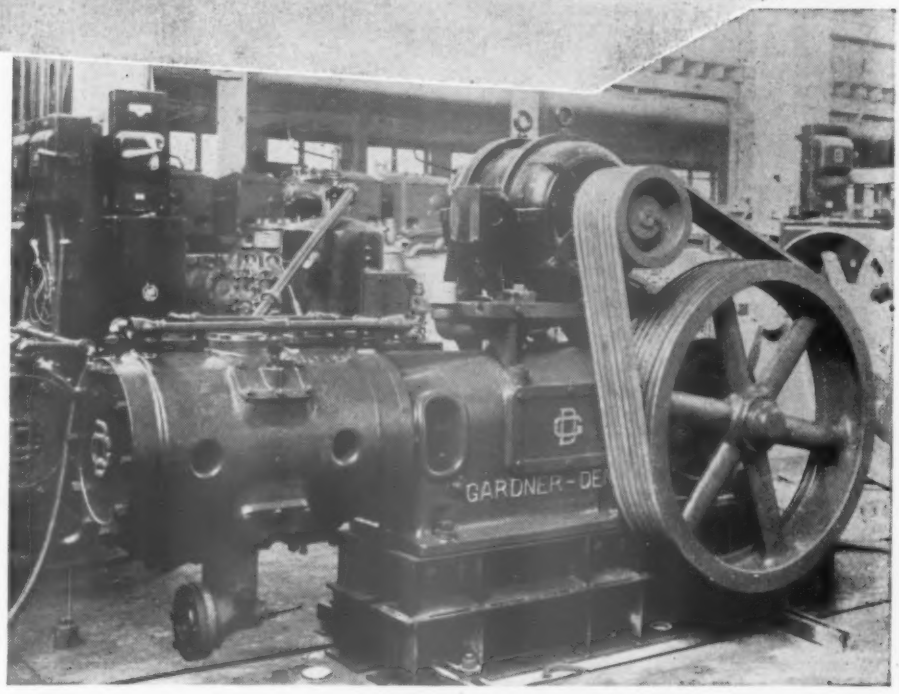
*Licensed for foundry use under U. S. Patent 2256832.

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

SIZED TO SUIT YOUR JOB!

When air is required at less than the usual shop pressures, you'll want to be sure your compressor is the correct size. And you *are* sure when you use a Gardner-Denver "RX" Compressor. For this compressor, built for heavy-duty, full-load service, is available in a wide range of sizes—correct for any capacity and any pressure.



Gardner-Denver "RX" Single Stage Horizontal Compressor—available in capacities from 89 to 1292 cubic feet displacement per minute.

Additional features which make the "RX" a favorite in so many industries:

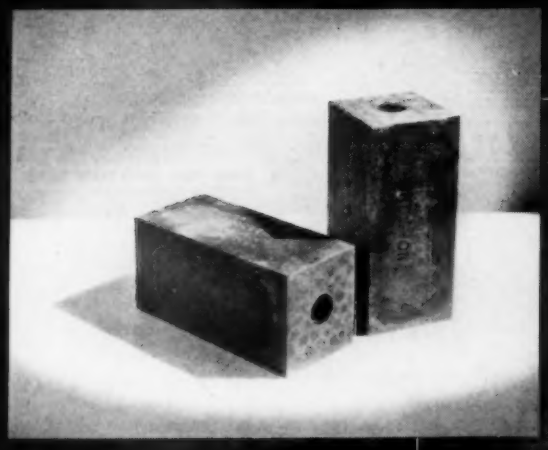
- **Duo-Plate cushioned valves — simple, durable, unusually quiet.*
- **Suction valve unloaders on all inlet valves result in lowest power consumption during unloaded period.*
- **Crankshaft supported by Timken adjustable double row tapered roller bearings.*
- **Main frame completely enclosed—oil and dust tight. All working parts are easily accessible.*

For complete information, write Gardner-Denver Company, Quincy, Illinois

GARDNER-DENVER SINCE 1859

CRYSTOLON Slag Hole Blocks

Pay Their Way in the Foundry

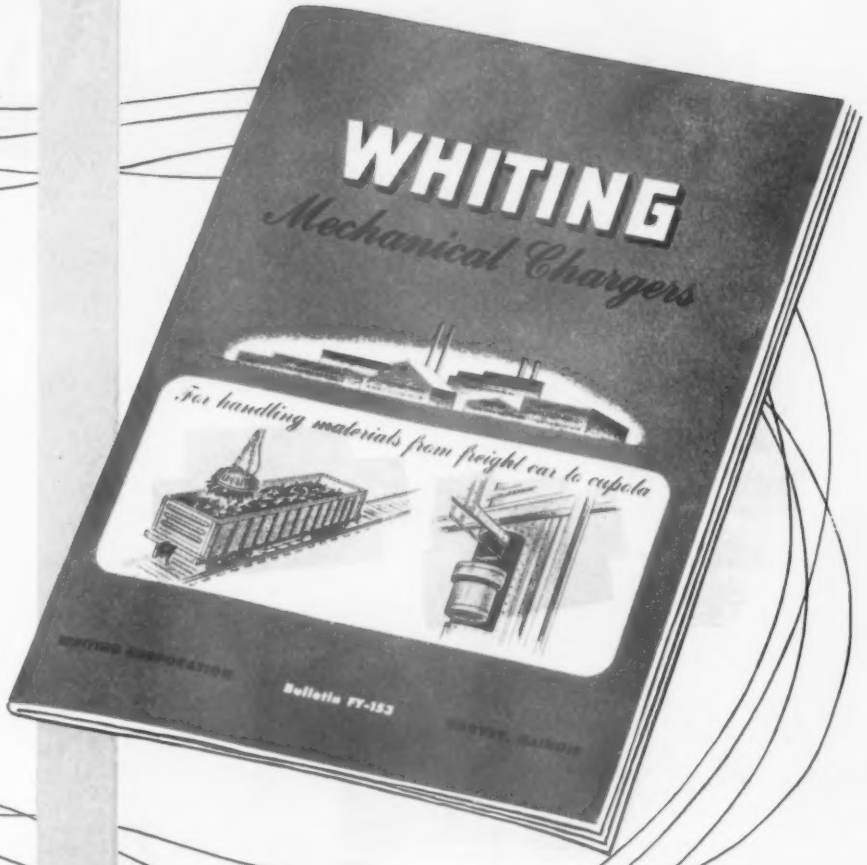


CRYSTOLON slag hole blocks, made by Norton Company of densely bonded silicon carbide grain, give long trouble-free service in foundry cupolas. The hard, dense surface of these chemically inert blocks is resistant both to the abrasion and penetration of molten slag. CRYSTOLON blocks resist all slag action either by corrosion or erosion. Consequently the hole size is maintained for a longer period of time giving better control of the flow. These rugged slag hole blocks are highly refractory and will neither soften nor spall at temperatures up to 1650°C.

NORTON REFRACTORIES LIKE HEAT

NORTON COMPANY · WORCESTER 6, MASS.

new information about mechanical charging



This new catalog—just off the press—tells how foundymen are reducing payroll costs, eliminating undesirable jobs, bringing greater safety and improved working conditions, and attracting a higher type of men to foundry work.

It shows the many different types of handling, make-up, and charging equipment which are available, and discusses the types of applications in which each is most useful. It shows typical layouts of successful charging installations in small foundries as well as large.

This valuable information is yours for the asking . . . write today.

ASK FOR BULLETIN FY-153

WHITING
CORPORATION
15607 Lathrop Avenue, Harvey, Illinois

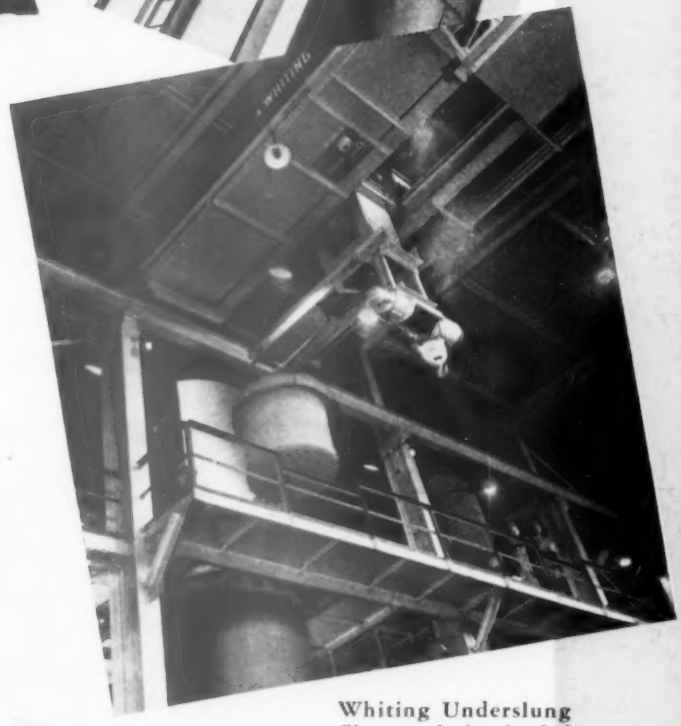
Let Whiting

Whiting Swiveled Skip Hoist serves two or more cupolas.

Vertical Skip Hoist with side-dump charging bucket—recommended for smaller size cupolas.

Engineers

help you visualize MECHANICAL CHARGING for your foundry



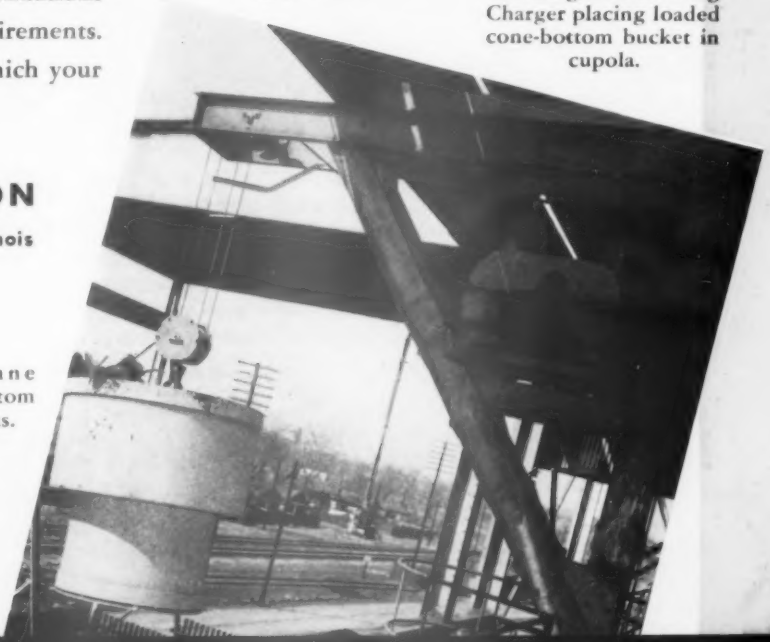
Whiting Underslung Charger placing loaded cone-bottom bucket in cupola.

They have the know-how that comes from planning and designing hundreds of successful charging installations . . . PLUS practical experience in coordinating materials handling, make-up, and charging into a unified, streamlined operation.

Since Whiting builds all types of chargers, their selection is not limited and their recommendations can be based strictly on individual plant requirements. They will gladly discuss various ways in which your charging can be mechanized.

WHITING CORPORATION

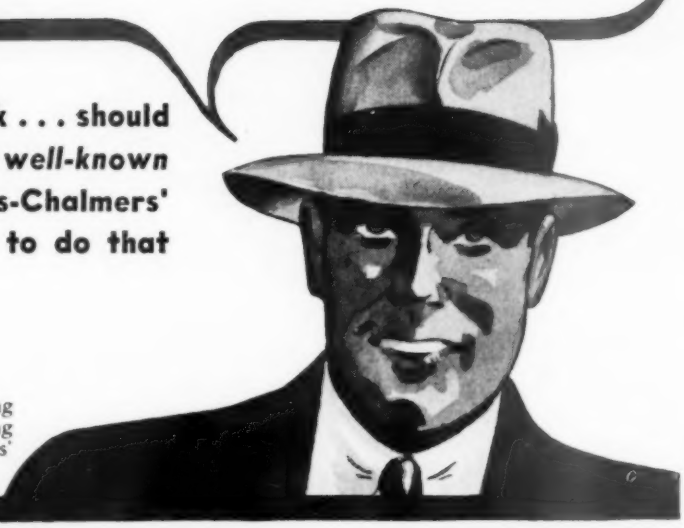
15607 Lathrop Ave. Harvey, Illinois



Motorized Jib Crane Charger with cone-bottom bucket, for two cupolas.

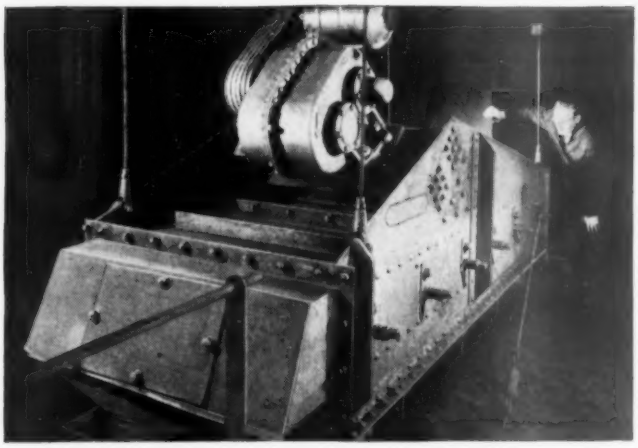
Mechanization
MAKES THE FOUNDRY A BETTER PLACE TO WORK!

"It eliminates dirty, disagreeable work . . . should result in lower production costs," says *well-known foundry expert*. Below, see how Allis-Chalmers' "Mechanized Equipment" is helping to do that very job in U. S. foundries!



NOTE: A-C *does not* offer foundry consulting or engineering service. It *cooperates* however with such firms in recommending foundry equipment which has been proven in Allis-Chalmers' own foundries.

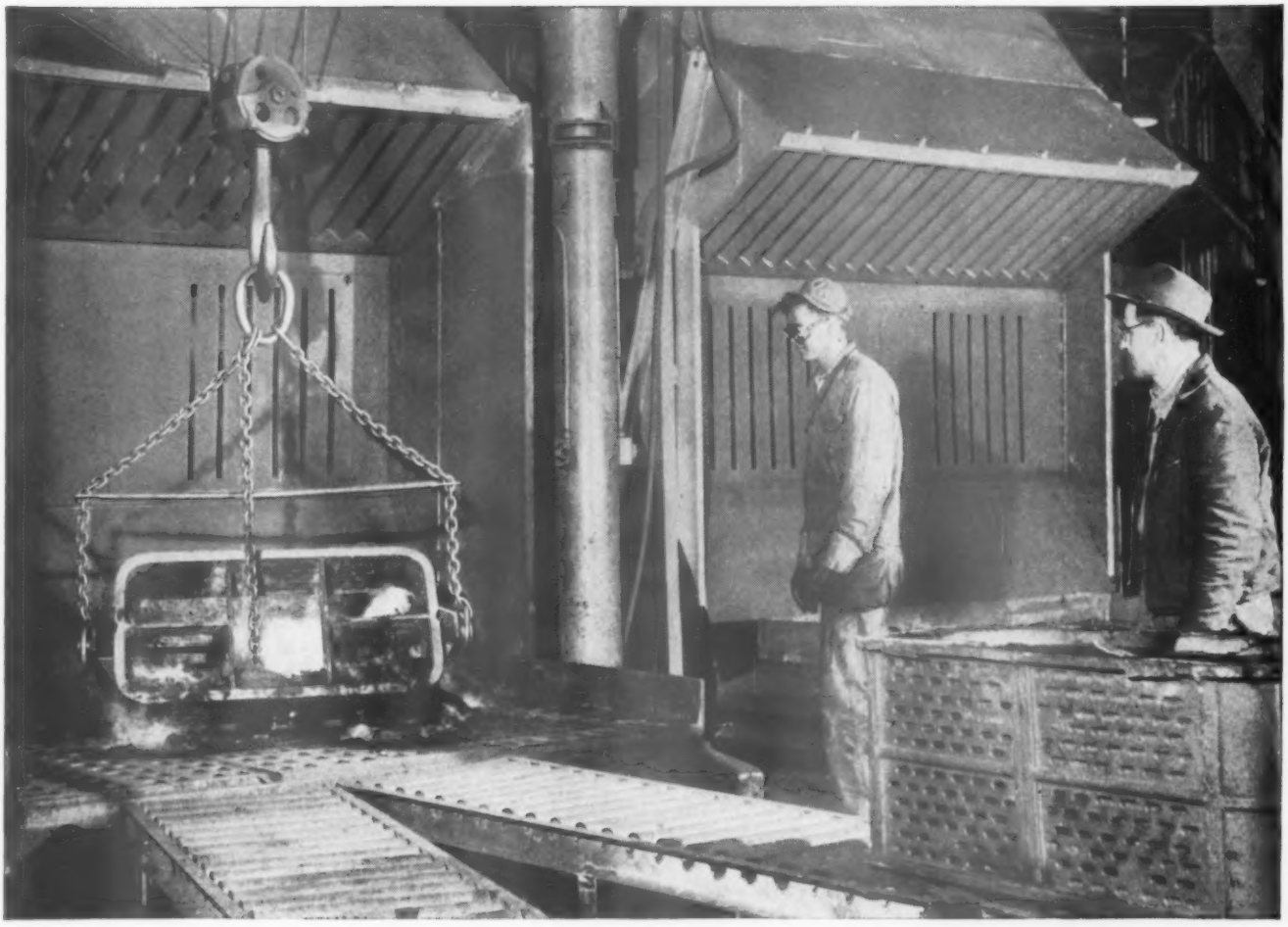
2. "OUR FOUNDRY HELP PROBLEM was licked by mechanization," says foundry operator. "Foundry shakeouts and screens have eliminated many heavy jobs . . . resulted in better control of dust and fumes, with casting output stepped up!" These statements are typical of the advantages accruing to foundries through better mechanization. A-C helps in other ways too. . . .



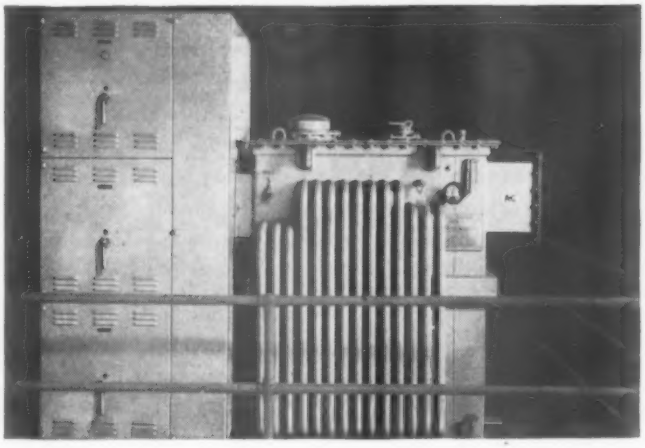
3. IN SAND RECLAMATION AND CONDITIONING. Vibrating screens for example, eliminated a scalping bottleneck for this foundry. A completely enclosed *Low-Head* screen and dust collector was installed which eliminated scalping problems. A complete line of A-C vibrating screens is available for all foundry screening jobs. Electrical improvements can help too. . . .

Foundromatic and Low-Head are Allis-Chalmers trademarks

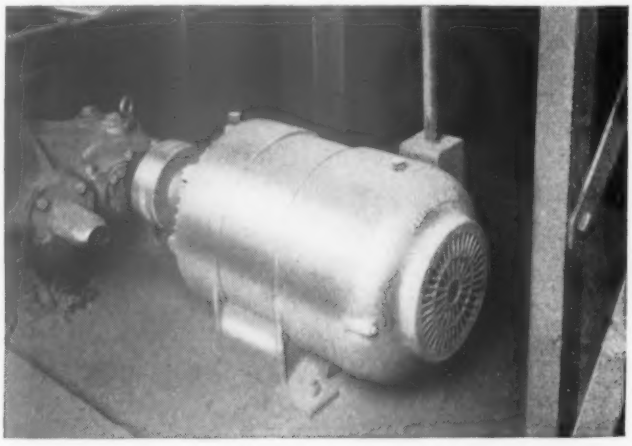
For Bigger Output...Better Working Conditions...MECHANIZE with



1. GOOD EXAMPLE are these two *Foundromatic* 2-bearing shakeouts which in conjunction with a sand slinger have almost *tripled* the casting output for the same amount of floor space with no extra help! *Foundromatic* shakeouts are in stock now in sizes: 4′ x 6′ Capacity 4 tons—5′ x 8′ Capacity 7½ tons—6′ x 8′ Capacity 18 tons—8′ x 10′ Capacity 25 tons. Series or parallel combinations for higher capacities. Here's another example . . .



4. LINE LOSSES can cut into foundry profits. Allis-Chalmers load center substations improve voltage regulation . . . cut losses by bringing *rated* voltage to foundry equipment. They are easy to install and maintain . . . eliminate long, costly runs of heavy secondary circuits . . . help to step-up machine efficiencies. A range of sizes for most foundry applications.



5. DEPENDABLE FOUNDRY POWER with a-c and d-c motors. Fan-cooled motors lick dirt, moisture and corrosion! Bulletin 6092A covers complete foundry line. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A 2390 MEMBER

ALLIS-CHALMERS

EXPAND YOUR FOUNDRY

without Building an Addition

'Pressed Steel' Annealing Boxes Cut Furnace Space Requirements

Sheet alloy annealing boxes furnished to size. Complete line of heat-treating equipment for foundry and steel mill. Welded alloy tubing to specifications.

Here is a practical way to expand foundry production without the expense of building. Take the case of a well-known malleable foundry. The battery of furnaces was completely equipped with 'Pressed Steel' sheet alloy annealing boxes. In each furnace 22 stands of our boxes, as pictured above, replaced 18 stands of cast boxes. The result, 100% increase in furnace output due to the space saving of these less bulky units.

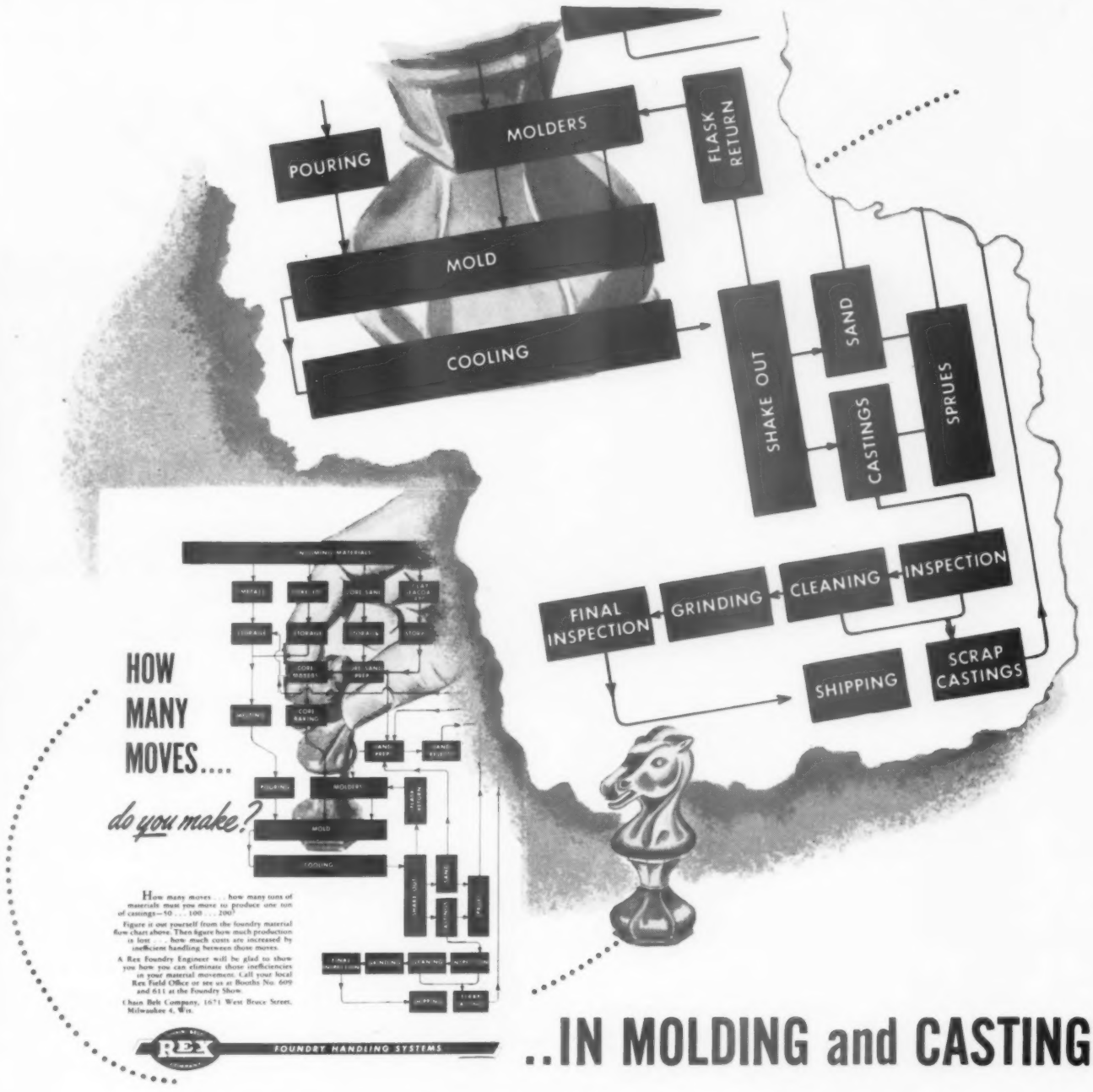
Plant records show these other substantial economies: 1) Fuel Saving--require less fuel and time to attain pot heat because of their light gauge; 2) Labor Saving--handle easier and faster; 3) Replacement Saving--installations in constant service for 10 years. Similar boxes for continuous malleablizing are standard in many of the nation's foundries. Send us blue-prints or write as to your needs.

THE PRESSED STEEL COMPANY

of WILKES-BARRE, PENNSYLVANIA

Industrial Equipment of Heat and Corrosion Resistant WEIGHT-SAVING *Sheet Alloys*

☆ ☆ ☆ OFFICES IN PRINCIPAL CITIES ☆ ☆ ☆



..IN MOLDING and CASTING?

How many moves . . . how many tons of material must the average foundry move to produce one ton of castings in just the steps between pouring and shipping? For example:

METALS. Figuring an average of 1.3 tons of metal per ton of finished castings, you move 1.3 tons from ladle—to mold—to cooling—to shakeout for a total of 3.9 tons handled.

SAND. From molding station—to pour—to cooling—to shakeout—to preparation, you move 6 tons of sand four times. Total, 24 tons handled.

CORE SAND. From molding station—to pour—to cooling—to shakeout—to preparation, you move .5 tons of sand four times. Total, 2 tons handled.

FLASKS. From molding station—to pour—to cooling—to shakeout—to molding station, you move 1 ton four times. Total, 4 tons handled (not including boards and weights).

CASTINGS. From shakeout—to inspection—to cleaning—to grinding—to inspection—to shipping, to carrier, you move 1 ton 6 times. Total, 6 tons handled. (Not counting heat treatment).

SPRUES AND SCRAP. From shakeout—to inspection—to dump, you move .3 twice. Total, .6 tons handled.

TOTAL TONS. 40.5 tons handled to produce one ton of castings in just this phase of foundry operations.

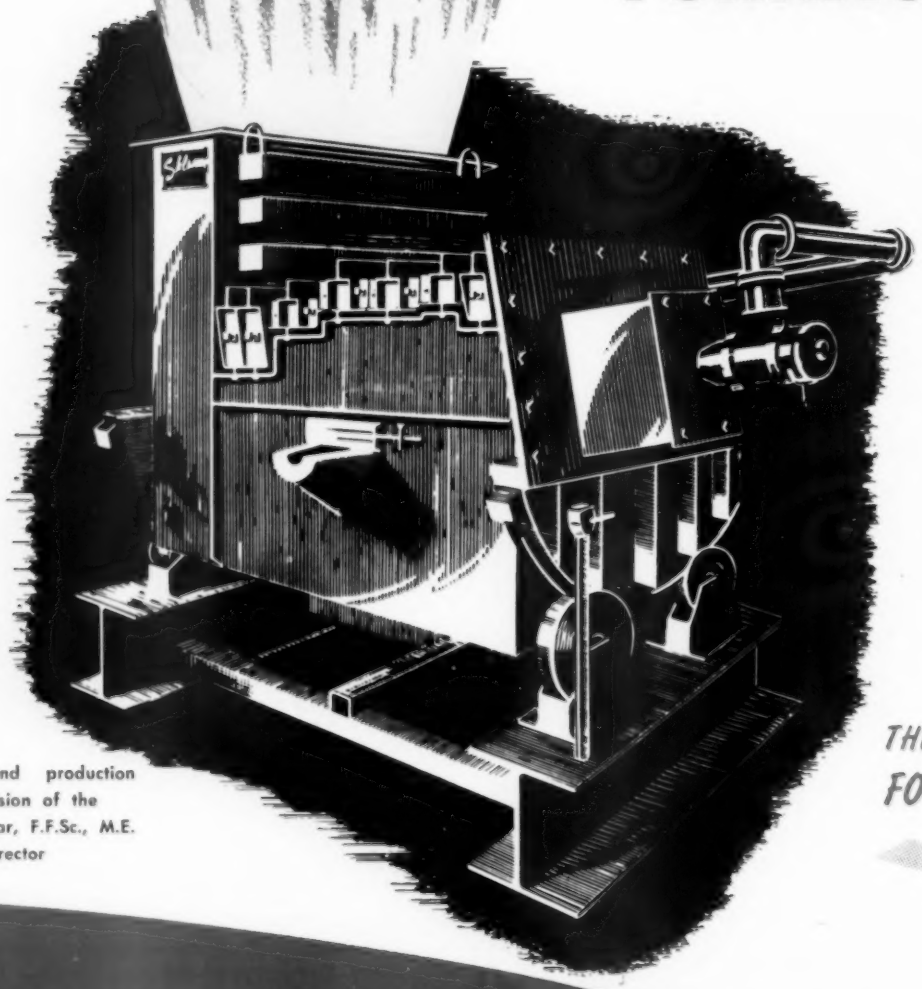
A Rex Foundry Engineer will be glad to show you how a cost-reducing and efficient flow of materials can be achieved by use of a Rex Foundry System. Chain Belt Company, 1671 West Bruce Street, Milwaukee 4, Wis.

CHAIN BELT REX COMPANY — FOUNDRY HANDLING SYSTEMS

THE ORIGINAL

Sklenar

NEW IMPROVED REVERBERATORY FURNACES



The Modern Method of Melting Metals

Patented, Patent Pending and Patents Applied for

All specifications and production under the supervision of the inventor, W. F. Sklenar, F.F.Sc., M.E. Technical Director

THE TALK OF THE '48 FOUNDRY SHOW!

SKLENAR FURNACE

A Subsidiary of

EXPORT OFFICE: Indianapolis Machinery Export Co.

38 MEMORIAL DRIVE

REDUCED MELTING TIME

COMPARISON OF COSTS*
(RED BRASS)

	SKLENAR	COST	CRUCIBLE TILT	COST
Total weight melted	259,270 lbs.		259,270 lbs.	
Number of heats	432			
Total hours labor (maint.)	26	26.52	64	65.28
Number Crucibles used (#120)			8	176.00
Fire brick	78	15.60		
Cement used	100 lbs.	8.90	400 lbs.	35.60
Fire clay used	400 lbs.	12.00	600 lbs.	18.00
Total hours labor daily for preparation	None		172 hrs.	175.44
Time of heats for melt	17 min. (600 lbs.)		40-50 min. (360 lbs)	
Total Maintenance Cost		$63.02		$470.32

★ The figures in the chart above are taken from the cost records on maintenance for a six months period, by a manufacturer operating the Sklenar Furnace #600-750 size and also the crucible tilting type furnace. Name of manufacturer gladly furnished on request.

means

DECREASED COSTS, INCREASED PRODUCTION!

SKLENAR melting means more heats, in less time, at lower cost. Therefore, your ratio of profit rises . . . your production increases all down the line. The table on Red Brass melting, above, is based on an actual, authenticated comparison conducted by a prominent eastern manufacturer. It *proves* SKLENAR REVERBERATORY FURNACES melt more tonnage, faster, at less cost!

MELT METALS CLEANER WITH Sklenar

Alert foundrymen *know* that a SKLENAR melt means a CLEAN melt. The advanced principle employed in the construction of SKLENAR REVERBERATORY FURNACES eliminates gas pick-up in non-ferrous melting. Actually, you can melt metals *cleaner* with *SKLENAR.*

SUPERHEATING:
(For Gray Iron)

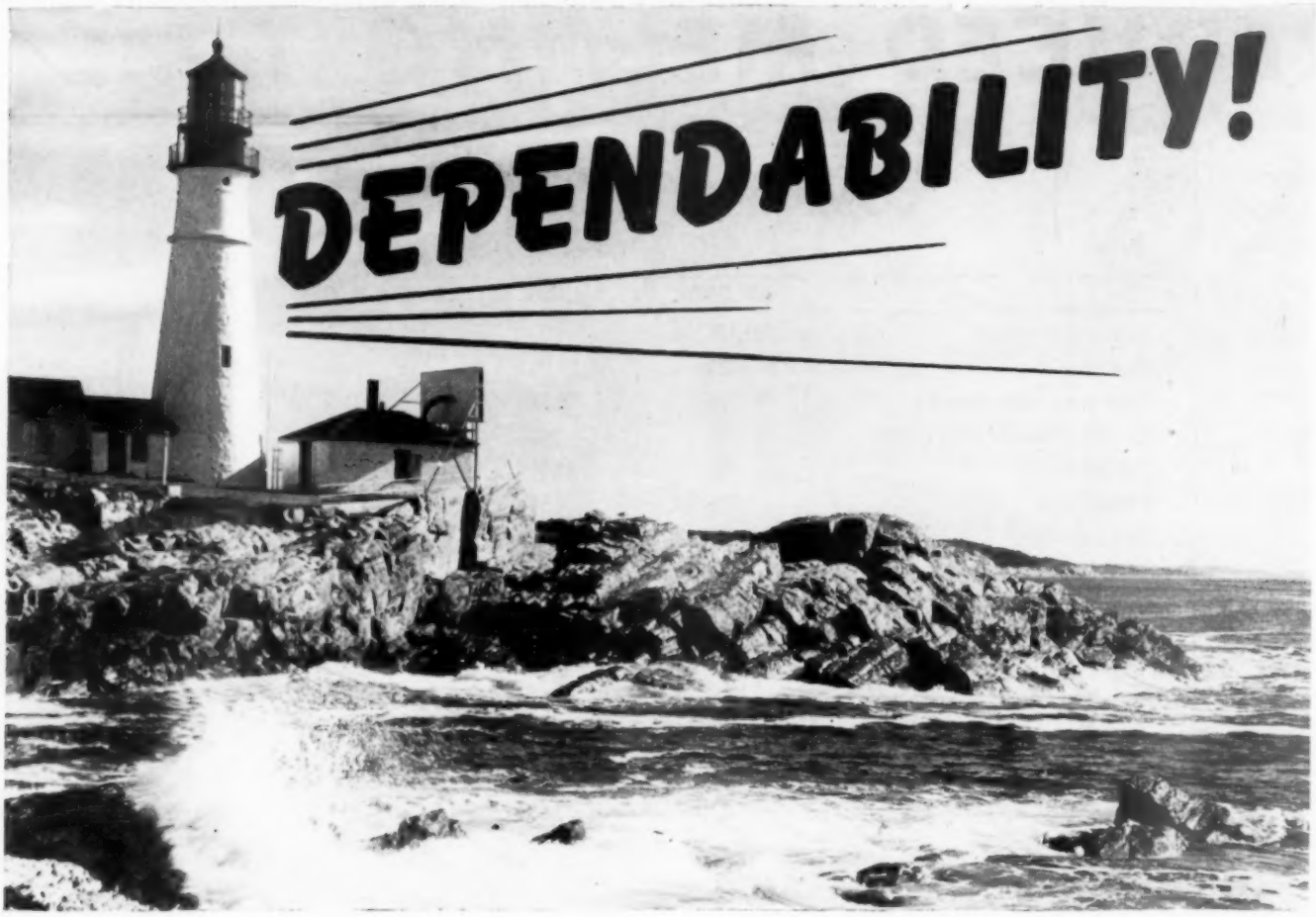
SKLENAR Furnaces can be used successfully either in conjunction with your present cupola for superheating or as a separate melting unit. Temperatures ranging up to 2950° can be obtained. Write for complete details.

AND MANUFACTURING CO., INC.

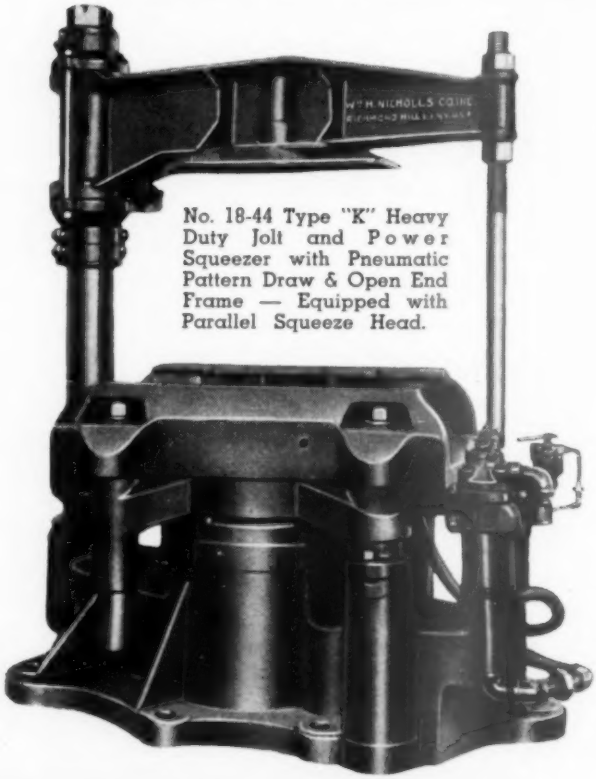
WILSON INDUSTRIES, INC.

44 Whitehall St., New York 4, N. Y.

CAMBRIDGE, 42, MASS.



● Nicholls Molding Machines give you DEPENDABILITY plus. You can DEPEND on these machines to withstand the pressure of constant use and to continually produce the maximum number of good molds. Nicholls Molding Machines place their DEPENDENCE on greater precision and power giving the best value at far lower costs. Nicholls has a complete line of stationary and portable types for the production of light, medium and heavy castings. Can be furnished with electric controls for push button operation.



No. 18-44 Type "K" Heavy Duty Jolt and Power Squeezer with Pneumatic Pattern Draw & Open End Frame — Equipped with Parallel Squeeze Head.

Wm. H. NICHOLLS Co., Inc.
RICHMOND HILL 18, LONG ISLAND, NEW YORK

ESTABLISHED 1910

Foreign Manufacturers and Selling Agents—For Continental Europe and Great Britain
George Fischer, Ltd., Schaffhausen, Switzerland

NICHOLLS

Continuous cleaning mill keeps rolling on Timken® bearings

IN this Ransohoff automatic dry cleaning mill, castings and sprue are handled in a continuous flow. A conveyor carries the material to the mill in which the castings are broken from the sprue. Both are discharged at the opposite end on to a conveyor for separation and inspection. With the adjustable pitch drum of the mill mounted on Timken bearing-equipped trunnion rollers, smooth, trouble-free operation is assured under the heaviest loads.

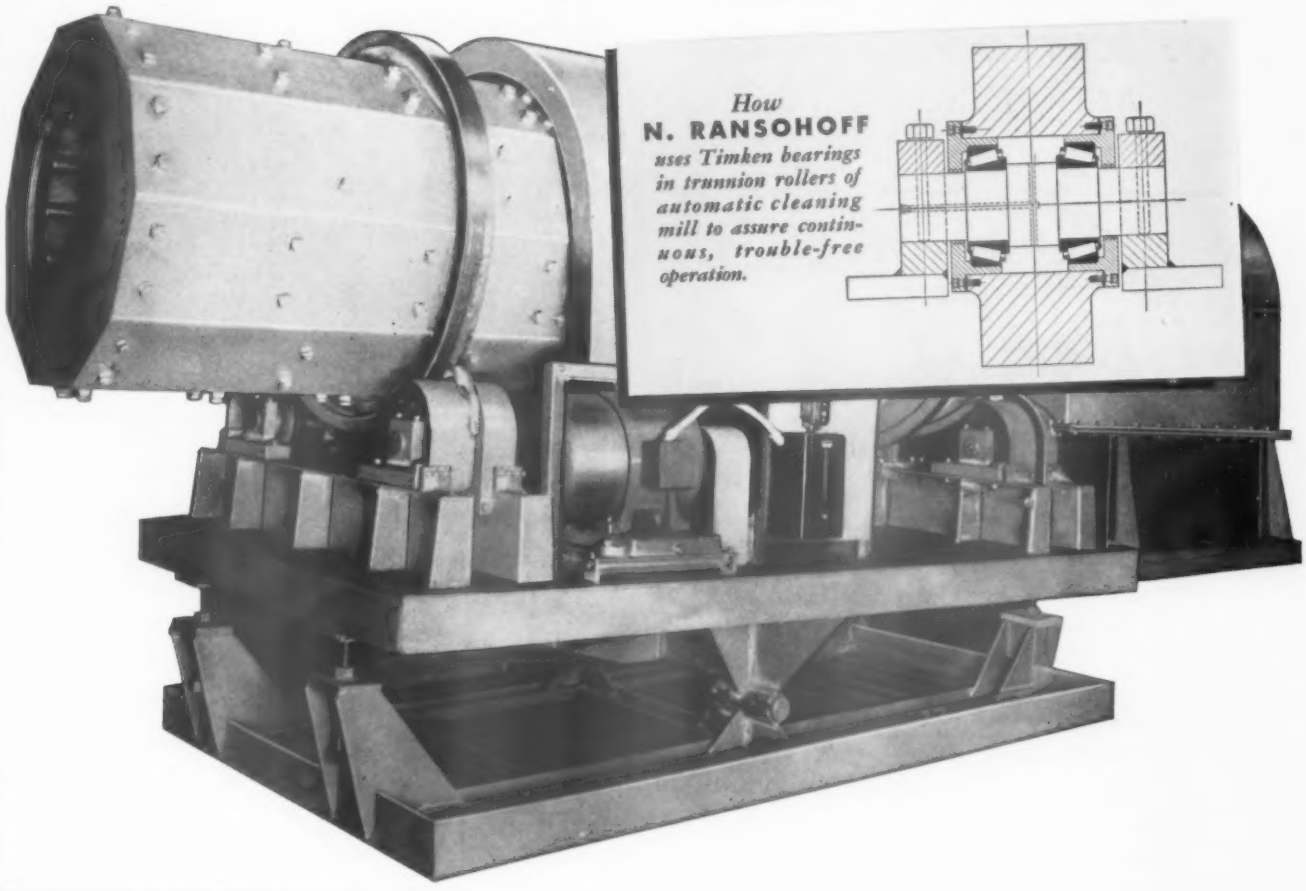
Timken tapered roller bearings are made from the finest bearing steel ever developed for this purpose—Timken fine alloy steel. Due to the line contact between rolls and races, Timken bearings have tremendous load carrying capacity. Their true rolling motion and incredibly smooth surface finish enable Timken bearings to operate freely, frictionlessly.

Timken bearings permit the use of closures which effectively retain lubricant, saving both maintenance time and material. And they take any combination of radial and thrust loads.

Over the years, the dependable performance of Timken bearings have made Timken-equipped products first choice throughout industry. Timken bearings in your product add a valuable sales feature—build greater acceptance among customers. When you specify tapered roller bearings for the equipment you buy or the equipment you make, specify "Timken". Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.



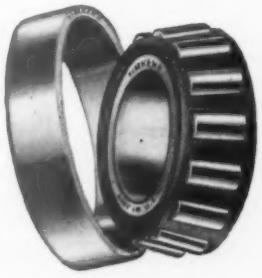
How
N. RANSOHOFF
uses Timken bearings in trunnion rollers of automatic cleaning mill to assure continuous, trouble-free operation.

TIMKEN BEARING CAPACITY RATINGS INCREASED 25%.

Since Timken bearings were re-rated some 15 years ago there has been such a further and constant improvement in quality that we are now able to announce a 25% increase in radial and thrust load carrying capacity. This may make possible the use of smaller bearings with savings in bearing cost, material cost and weight. Engineers will be able to utilize the advantages of Timken bearings in more applications than in the past.

A new Timken Engineering Journal, now in preparation, will give you complete capacity rating tabulations. For further assistance, write us today.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



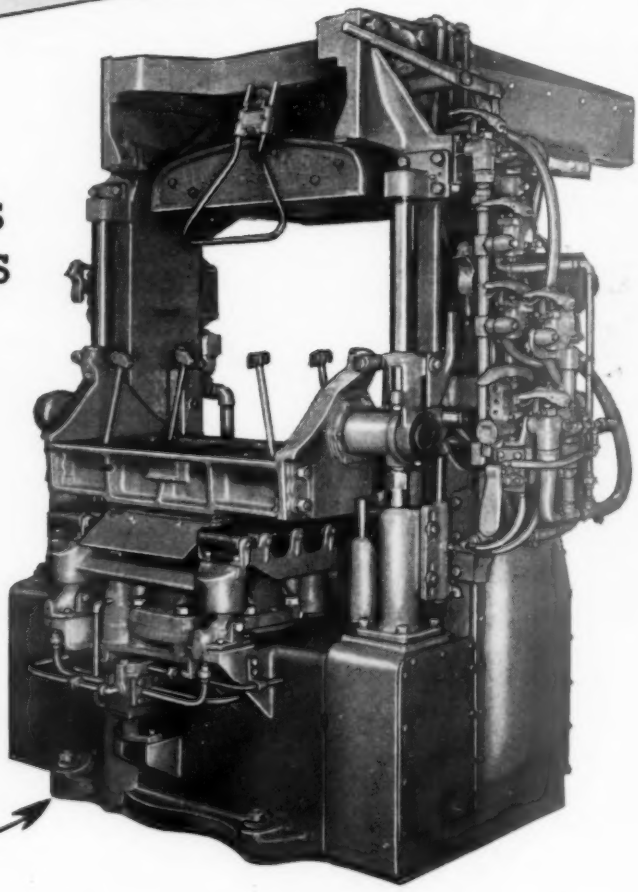
NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▱ BEARING TAKES RADIAL ▯ AND THRUST ⊣▯⊢ LOADS OR ANY COMBINATION

Under Jolt Moulders

FABREEKA

REDUCES
THE DESTRUCTIVE EFFECTS
OF HEAVY IMPACT SHOCKS
AND VIBRATION . . .

CROSS SECTION OF FABREEKA INSTALLATION



FABREEKA Pads, bushings, and washers are installed under Jolt Moulders, Shakeout Machines, Tumbling Barrels and other heavy machinery to reduce the effects of heavy impact shocks and destructive vibration.

FABREEKA has demonstrated its ability to prevent breakage of machine parts and to keep bolts tight, thereby reducing maintenance and increasing production.

In addition to these important advantages, Fabreeka has long life, which makes its final cost a low cost.

Write for latest literature

FABREEKA PRODUCTS COMPANY, INCORPORATED
222B Summer Street
Boston 10, Mass.

It Pays to Specify Fabreeka

for IMPACT SHOCK and VIBRATION

It's BRIDGEPORT FIRST in Grinders

THE most practical solution to mounting manufacturing costs lies in machinery that can set new standards of speed and economy. Have you considered the fact that this applies to grinding as well as to other machining operations? If not, you owe it to yourself to take stock of the grinding equipment in your plant. If it's obsolete, chances are it's bottlenecking your production. It will pay you to invest in new equipment, designed from the ground up to make your production more profitable. To help you do this, Bridgeport makes a complete line of grinding machinery for nearly every grinding, buffing and cut-off requirement, ranging from the sharpening of paper-cutting knives to snagging heavy castings. Bridgeport machines are built big to permit heavy feeds on hardest stock, and to produce a smooth, accurate finish that frequently eliminates second operation work.

In some plants Bridgeport Grinders are setting new cost-cutting records; in others, they are pointing the way to completely new methods of metal removal. Whatever your grinding problem, Bridgeport equipment engineers and abrasive specialists are ready to give you the best machine and the best abrasive wheel for every job.

BRIDGEPORT SAFETY EMERY WHEEL CO.
1302 West Broad Street, Stratford, Connecticut

Just off the press . . . Bulletin 2700 on Bridgeport Heavy Duty Face and Knife Grinders. Write for it today.

Bridgeport GRINDERS

Horizontal Face Grinders, Vertical Grinders, Cutlery Grinders, Buffing Lathes, Knife Grinders, Floor Stand Grinders, Abrasive Cut-off Machines, BuXite Abrasive Wheels.

SPACE SAVER

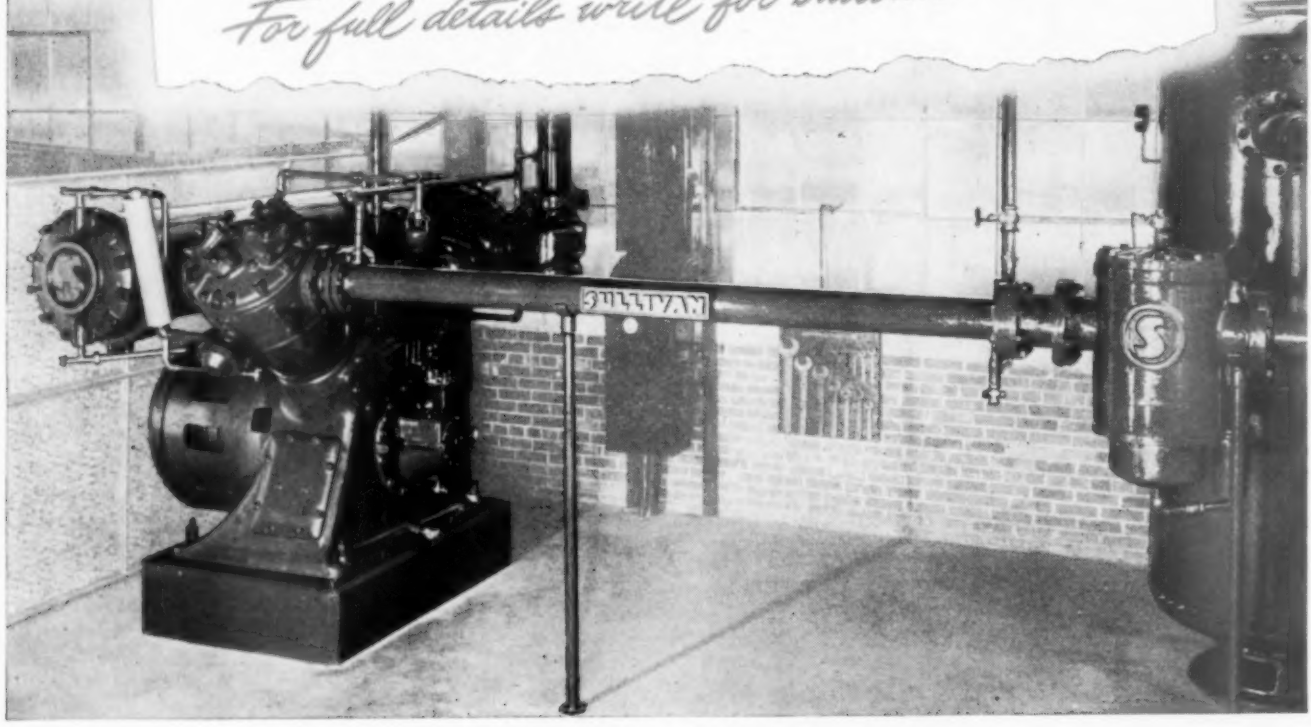
THAT PROVIDES LOW-COST COMPRESSED AIR

SERIES WN-112

for capacities of 378 to 1828 cfm, pressures up to 125 psi

If space is precious in your plant, that's one more reason why you'll want to specify the Joy WN-112 Compressor. It's more compact than other compressors of equivalent capacity because of its advanced design and use of alloy metals—and it operates more economically . . . gives longer heavy duty service. Installation is simple, and maintenance low.

For full details write for bulletin A-52



Joy Air Compressors

PORTABLE AND STATIONARY — ¼ HP TO 600 HP

ALWAYS DEPENDABLE!

W&D 1512

Consult a Joy Engineer

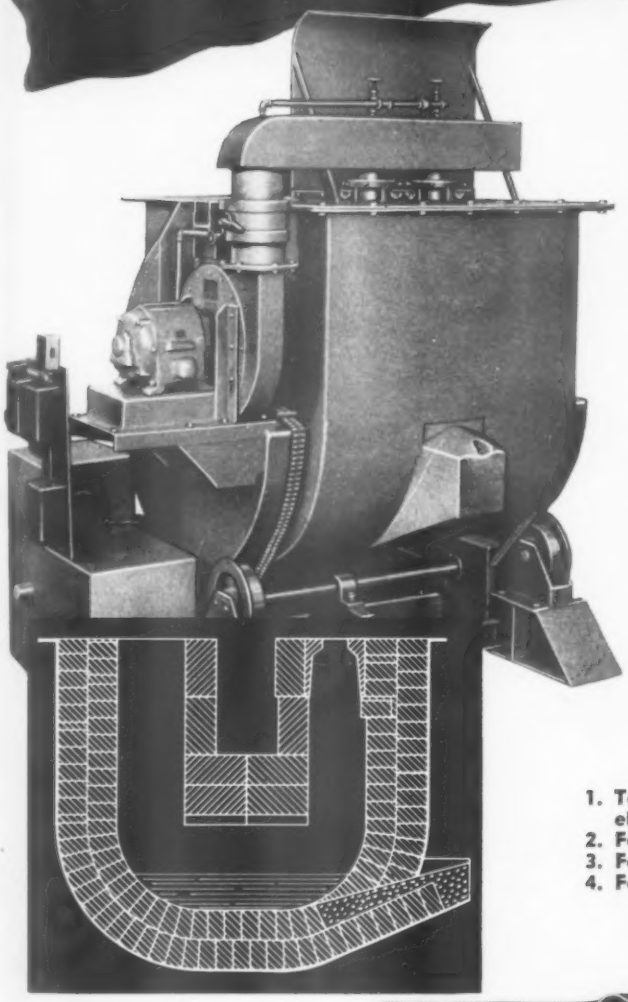
SULLIVAN DIVISION

JOY MANUFACTURING CO.

GENERAL OFFICES: HENRY W. OLIVER BLDG., PITTSBURGH, PA.

FIRST SHOWING!

The New Stroman "U" Type Reverberatory DIRECT FIRED FURNACE



This furnace is a recent development that has come about as the result of the Stroman Furnace & Engineering Company's wide experience with open flame Reverberatory type metal melting furnaces. Results show that a great deal can be accomplished with this type of furnace, particularly for high temperature work on ferrous alloys, monel, nickel silver, brass and bronze alloys.

We feel certain that this furnace can be operated with lower metal losses in brass alloys than any other type of furnace. On the ferrous metals such as gray iron, gray iron alloys, the ferro-alloys such as ferro-silicon, and ferro-manganese, excellent results have been obtained.

This furnace can be supplied as gas fired, oil fired or with combination burners with which it is possible to switch very simply from either gas to oil and vice-versa.

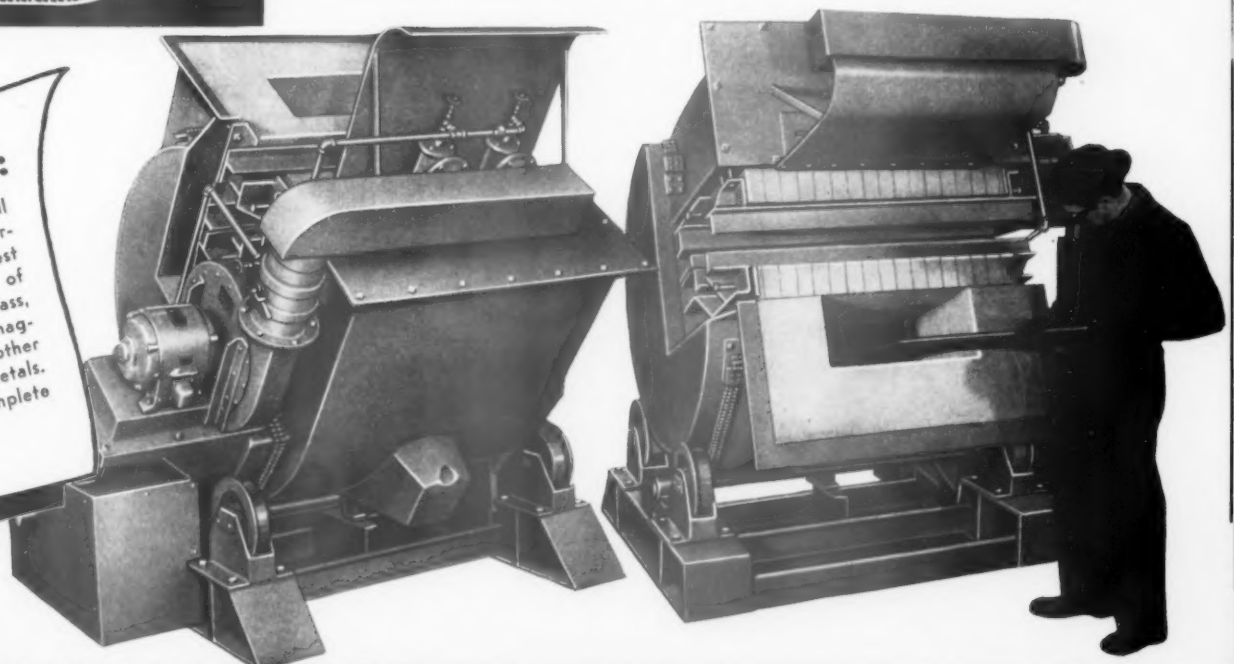
This furnace was designed and developed keeping the following outstanding features in mind:

1. **To improve working conditions by elimination of heat.**
2. **For ease of charging.**
3. **For ease of skimming.**
4. **For ease of alloying.**
5. **For ease of repairing.**
6. **Lower Fuel consumption.**
7. **Longer lining life. (Less repairs.)**
8. **Better control of atmosphere.**

Built in Sizes to Meet Your Needs

REMEMBER:

Stroman makes all types and sizes of furnaces for the finest and fastest melting of iron, iron alloys, brass, bronze, aluminum, magnesium and all other non-ferrous metals. Write for complete literature.



STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.

Want to see your grinding costs take a dive?

Are your grinding costs as low as you'd like?

Even if they seem to be *reasonably* low, the chances are that Peninsular can drop them even *lower!*

Not by furnishing inexpensive stock wheels: purchase-price savings are false economy. Peninsular helps your costs take a dive by supplying the *right* wheel, custom-tailored to every job.

Peninsular savings come to you through efficient operation. By reducing wheel wear, lowering dressing time and increasing stock removal, Peninsular brings you consistent savings with every spin of the wheel.

That's because every Peninsular recommendation is backed by a thorough examination and analysis of your grinding problems—the materials you grind, the machines and methods you use, the finishes you need. Every Peninsular grinding wheel is *individually engineered* to do its specific job.

When may one of our engineers call on you, and show you where and how Peninsular wheels can lower your grinding costs?

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS

These illustrations are made up of photographs of standard types and sizes of grinding wheels manufactured by Peninsular.

3 REASONS WHY

FERROCARBO Briquettes help produce top quality Cast Iron

1 MORE EFFECTIVE DEOXIDATION AND INOCULATION

Readily soluble in molten iron, the components of FERROCARBO briquettes provide powerful deoxidation and inoculation. Oxides are reduced and eliminated. Super-heated iron of greater fluidity is obtained. Foundry operating variables are reduced. Cleaner, sharper castings are poured.

2 IMPROVED STRUCTURE

Ferrocarbo-treated irons are characterized by a dense, close-grained structure, free from chill or porous areas even though varying widely in metal section. Uniform graphite size and distribution are obtained regardless of silicon-carbon ratio, thereby eliminating segregation.

3 SUPERIOR MECHANICAL PROPERTIES

The use of FERROCARBO briquettes insures a cast iron structure with improved mechanical properties, machinability and service performance.

CUPOLA addition of FERROCARBO briquettes to a properly adjusted charge greatly lengthens the useful life of all types of cast iron. For metallurgical advice on their use in your operation—for actual service data, write The Carborundum Company, Abrasive Grain and FERROCARBO Division, Niagara Falls, New York.

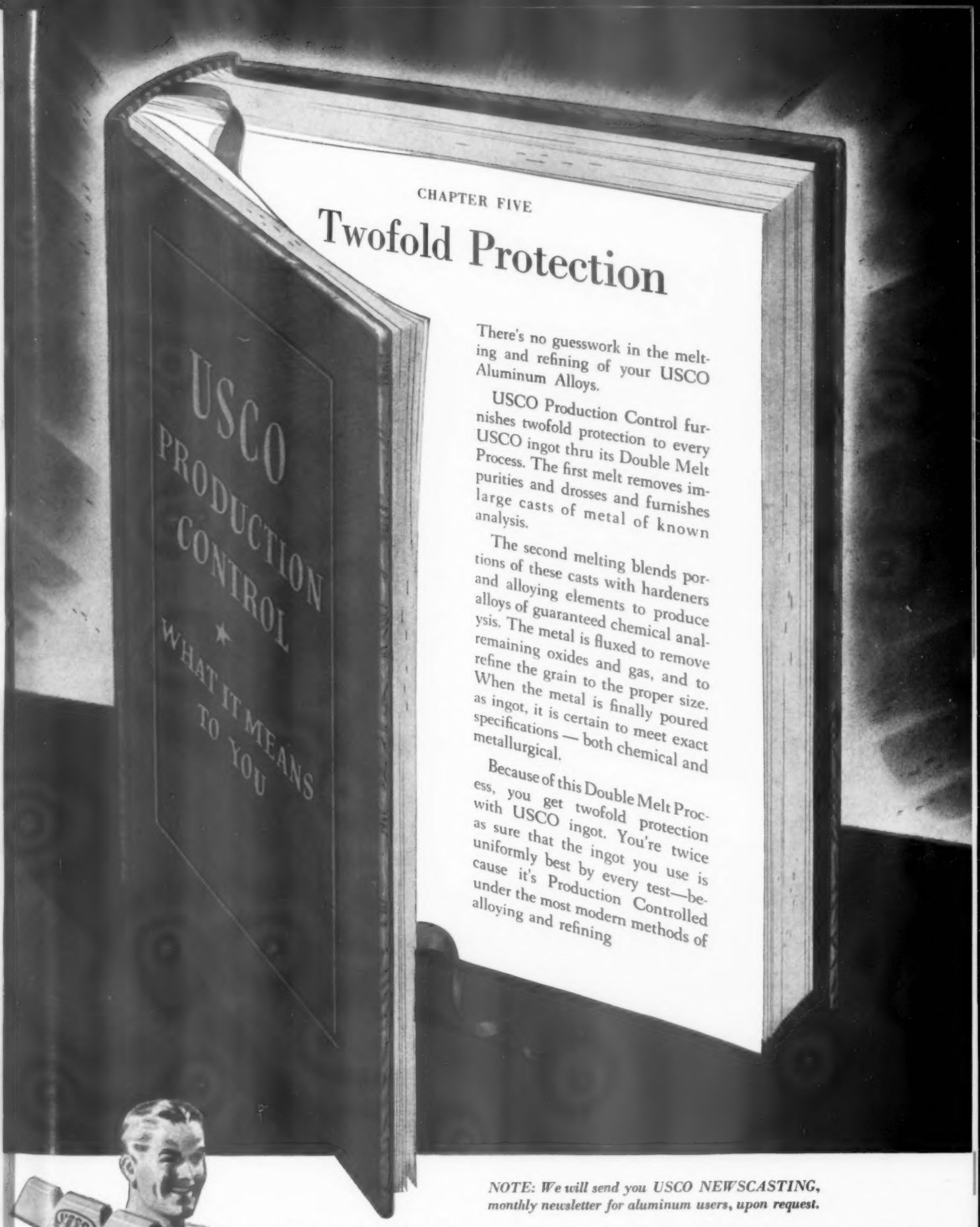
FERROCARBO Briquettes

BY CARBORUNDUM

TRADE MARK

FERROCARBO Distributors: Ketchner, Marshall & Co., Pittsburgh, Cleveland and Birmingham; Miller and Company, Chicago, St. Louis and Cincinnati

"Carborundum" and "Ferrocarbo" are registered trademarks which indicate manufacture by The Carborundum Company



CHAPTER FIVE

Twofold Protection

There's no guesswork in the melting and refining of your USCO Aluminum Alloys.

USCO Production Control furnishes twofold protection to every USCO ingot thru its Double Melt Process. The first melt removes impurities and drosses and furnishes large casts of metal of known analysis.

The second melting blends portions of these casts with hardeners and alloying elements to produce alloys of guaranteed chemical analysis. The metal is fluxed to remove remaining oxides and gas, and to refine the grain to the proper size. When the metal is finally poured as ingot, it is certain to meet exact specifications — both chemical and metallurgical.

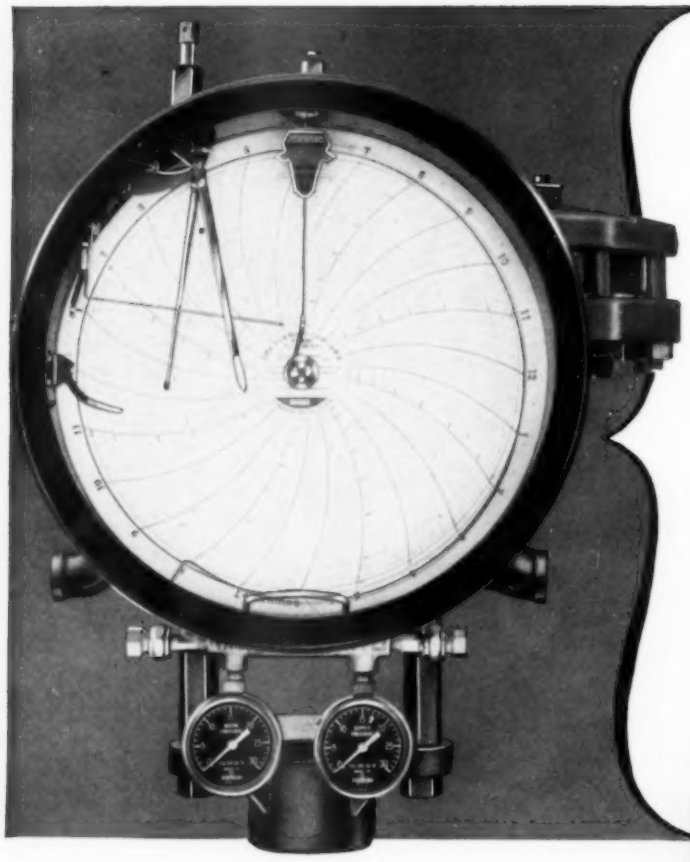
Because of this Double Melt Process, you get twofold protection with USCO ingot. You're twice as sure that the ingot you use is uniformly best by every test—because it's Production Controlled under the most modern methods of alloying and refining

NOTE: We will send you USCO NEWSCASTING, monthly newsletter for aluminum users, upon request.

USCO ALUMINUM

Pioneer Producers of Quality Aluminum Ingot

U. S. REDUCTION CO. *East Chicago, Ind.*



You'll get Better Heats IF You Weigh Air Too . .

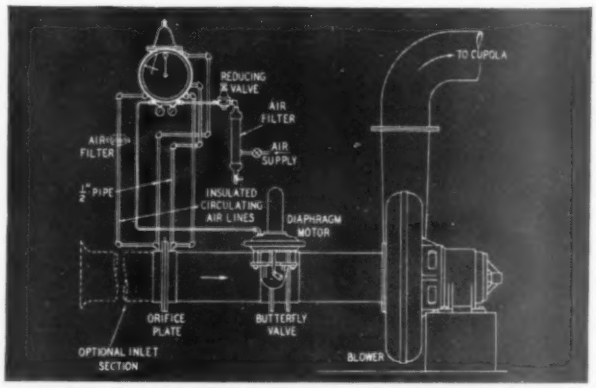
BETTER HEATS, uniform melting conditions, better quality iron, and a lot of other advantages have been directly traced to the *control of air by weight* in the cupola.

This is easy to understand, if you stop to consider that the weight of oxygen consumed, rather than apparent air volume, is the prime factor in producing uniform cupola conditions.

With Foxboro Air-Weight Controllers which automatically control the weight of air, you don't have to worry about cold iron, or pigging or oxidizing of iron, when the weather changes . . . or when air blast temperature varies. Check this with any of the hundreds of foundries where Foxboro Air-Weight Controllers have been installed. You'll find that the most efficient and economical conditions have become their standard operating conditions.

Write for Bulletin 268-2 containing full details of this easily-installed production booster. Ask for names of users in your vicinity. **The Foxboro Company, 32 Neponset Avenue, Foxboro, Mass., U. S. A.** Branches in principal cities.

Simple Foxboro Air-Weight Controller installations like this, increase output and improve quality.

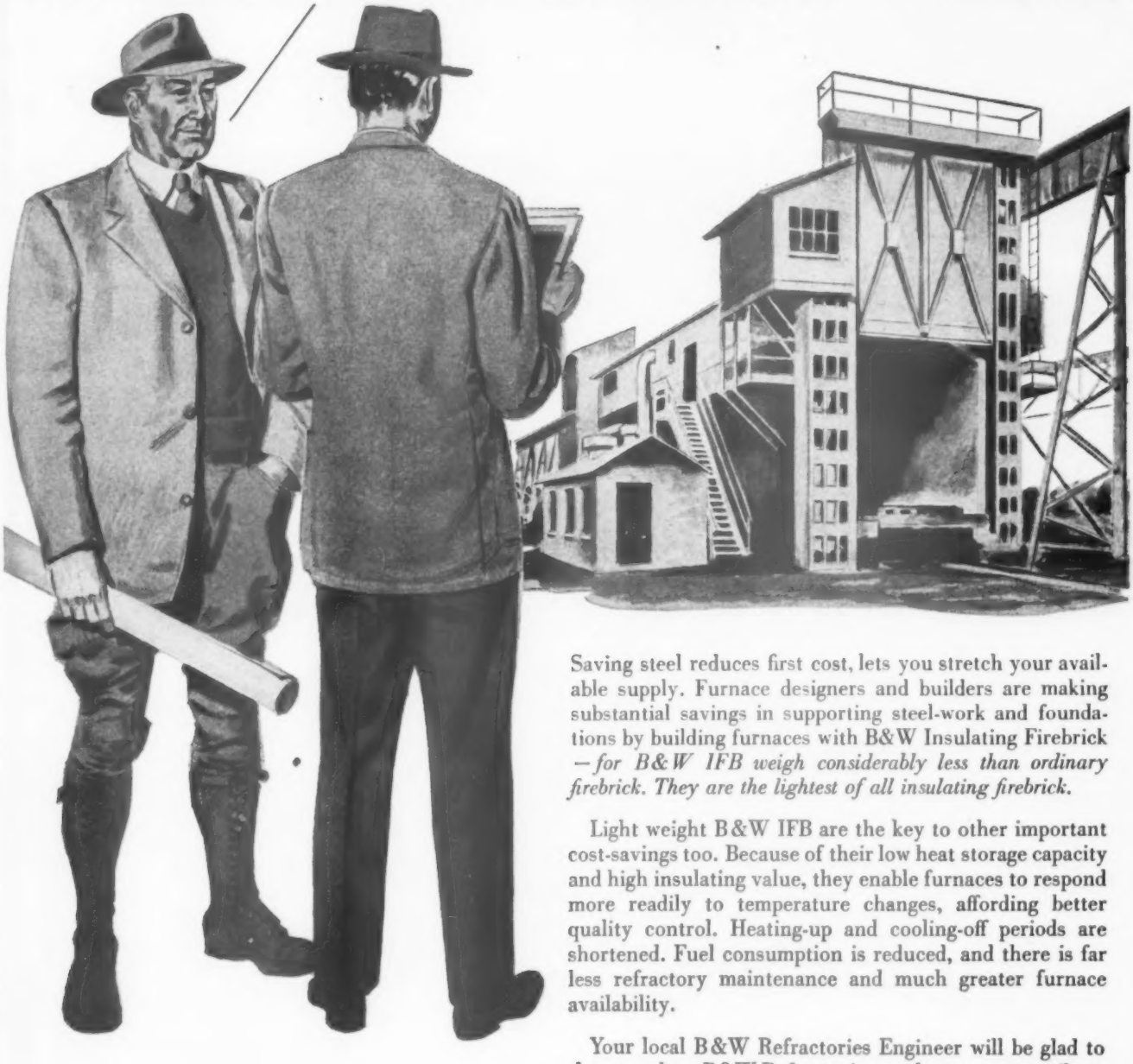


Foxboro Air-Weight Controller is easily adapted to positive displacement blower, or to centrifugal blower (as in diagram above.)

FOXBORO REG. U. S. PAT. OFF. **AIR-WEIGHT CONTROLLERS**

And you save on steel-work, too, by using

LIGHTWEIGHT B&W INSULATING FIREBRICK



Saving steel reduces first cost, lets you stretch your available supply. Furnace designers and builders are making substantial savings in supporting steel-work and foundations by building furnaces with B&W Insulating Firebrick *—for B&W IFB weigh considerably less than ordinary firebrick. They are the lightest of all insulating firebrick.*

Light weight B&W IFB are the key to other important cost-savings too. Because of their low heat storage capacity and high insulating value, they enable furnaces to respond more readily to temperature changes, affording better quality control. Heating-up and cooling-off periods are shortened. Fuel consumption is reduced, and there is far less refractory maintenance and much greater furnace availability.

Your local B&W Refractories Engineer will be glad to show you how B&W Refractories products may contribute to lower first cost and greater overall production efficiency in *your* furnaces.

R-320

B&W REFRACTORIES PRODUCTS

B&W 80 FIREBRICK • B&W JUNIOR FIREBRICK
B&W 80 GLASS TANK BLOCKS • B&W INSULATING FIREBRICK
B&W REFRACTORY CASTABLES, PLASTICS AND MORTARS

•

OTHER B&W PRODUCTS

Stationary & Marine Boilers and Component Equipment
Chemical Recovery Units . . . Seamless & Welded Tubes . . . Pulverizers
Fuel Burning Equipment . . . Pressure Vessels . . . Alloy Castings

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 85 LIBERTY ST., NEW YORK 6, N.Y.
WORKS: AUGUSTA, GA.

"Mulling the sand every time it is used has greatly improved the quality of our castings and reduced our scrap loss"

Our New Name is
RELIABLE CASTINGS CORPORATION
The RELIABLE PATTERN & CASTINGS CO.
3530 SPRING GROVE AVENUE CINCINNATI 23, OHIO

March 14th
1947

National Engineering Co.,
549 W. WashingtonBlvd.,
Chicago 6, Illinois.

Attention of Mr. Bruce L. Simpson
President

Gentlemen:-

It was indeed a pleasure to have your Mr. Fuller call on us last week, not to sell us something, but merely to check on the molding system you installed for us some two years ago. Such personal interest is one of the reasons we have found our National installation so satisfactory; you did not forget us once the equipment was installed and paid for.

The installation of this sand handling equipment has given us advantages in labor saving, but most important to us has been the improvement in the conditioning of our molding sand. Mulling the sand every time it is used has greatly improved the quality of our castings and reduced our scrap loss.

We have had very little maintenance on this system and are very much pleased with the installation and we thought you would like to have this tangible expression of our satisfaction.

Yours very truly,

RELIABLE CASTINGS CORPORATION

Arthur Kuhn

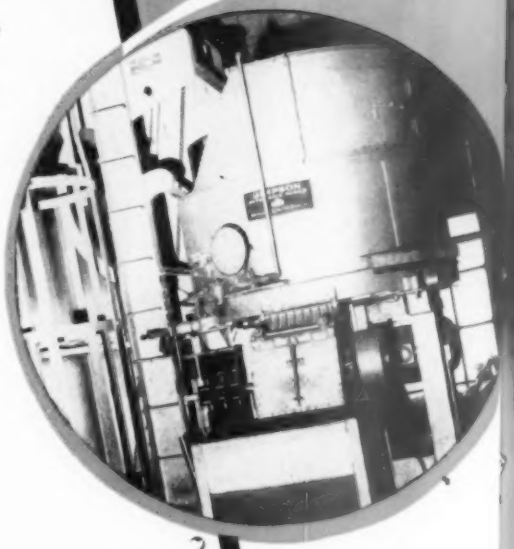
Arthur Kuhn, Secy.-Treas.

AK:LSB

- WOOD AND METAL PATTERNS
- PRESSURE CAST ALUMINUM MATCH PLATES AND COPE AND DRAG EQUIPMENT
- BRASS, BRONZE AND ALUMINUM SAND CASTINGS MADE TO ANY SPECIAL ANALYSIS
- PERMANENT MOLD ALUMINUM CASTINGS
- PERMANENT MOLD SEMI-FINISHED BRONZE BUSHINGS
- AMPCO AND EVERDUR CASTINGS

1922 . . . 1947
OUR 25th ANNIVERSARY
Thanks To You!

Right: Molding sand preparation plant at the Reliable foundry, showing storage bin, automatic discharge gate and skip hoist which carries sand to the Simpson Mixer on the platform. *Below:* Closeup view of the mixer, with sand delivery buggy below aerator.

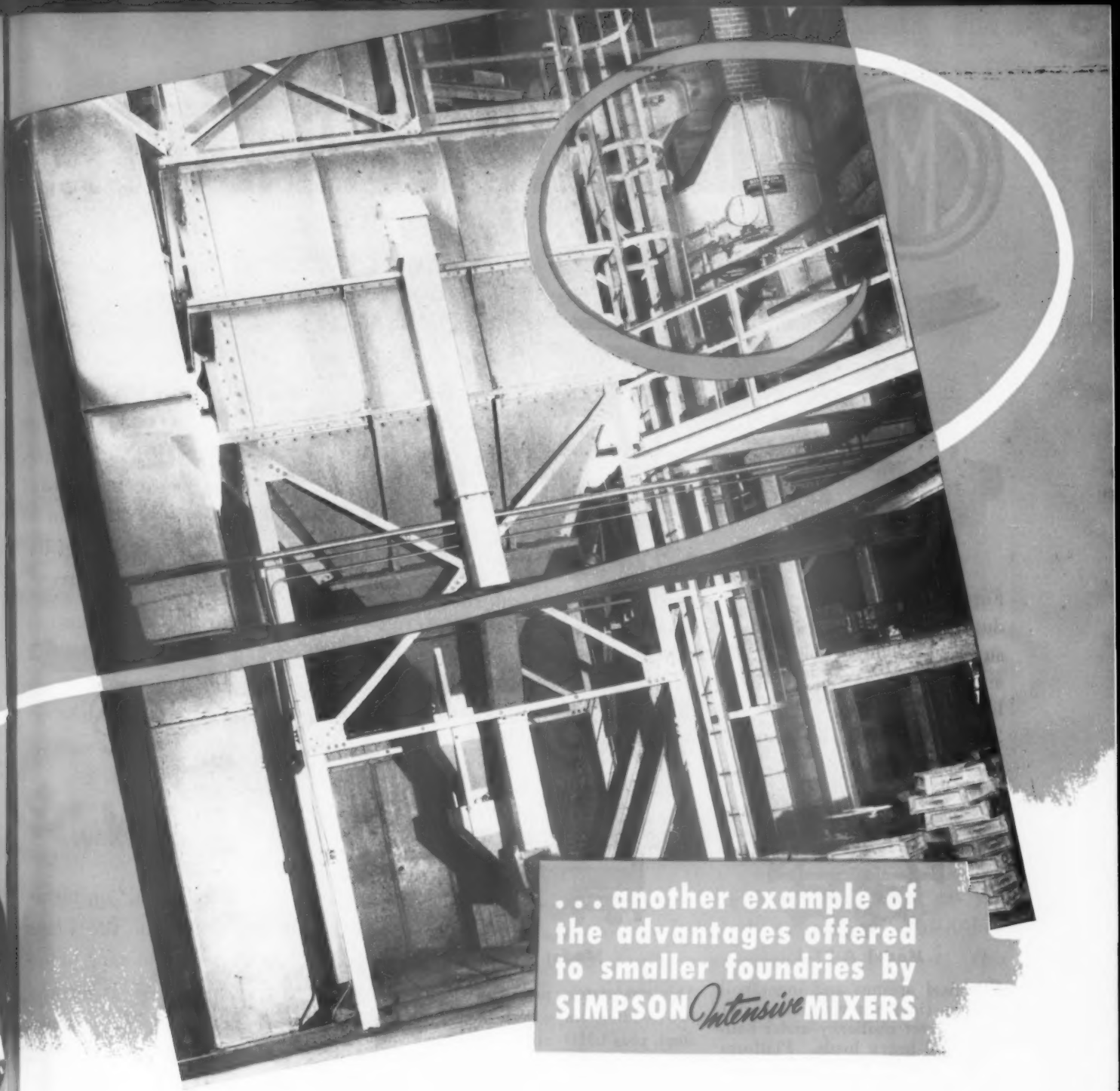


MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

NATIONAL ENGINEERING COMPANY

608 MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia



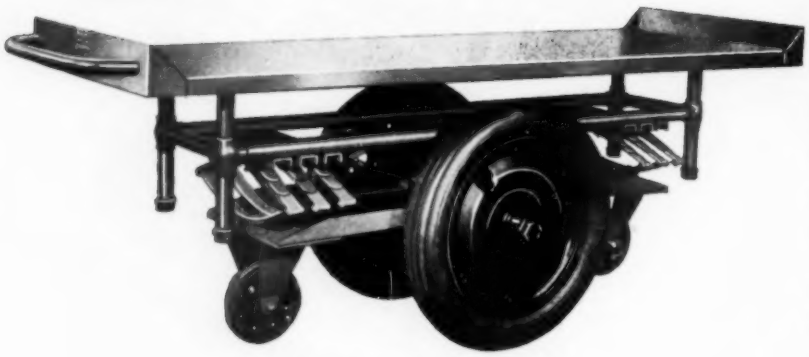
. . . another example of the advantages offered to smaller foundries by SIMPSON *Intensive* MIXERS

• The advantages of Simpson Mixers are definitely *not* limited to larger iron and steel foundries. More and more non-ferrous foundries, including numerous smaller operators, are taking advantage of the lower production costs . . . lower operating costs . . . lower maintenance costs...less installation space required . . . faster production . . . and the constantly higher product quality available by the controlled mixing of sands in a Simpson Mixer.

A typical example of a small, yet complete sand preparing plant, designed around a Simpson Mixer, is demonstrated at the Reliable Castings Corporation. This unit provides extreme compactness with maximum sand storage capacity, and also permits the mixer operator to handle both sand preparation and distribution. Because of the mixer's location at hopper level, molding sand may be delivered manually by buggy, or by the conventional belt conveyor method.

Here, then, is a sand preparing plant designed especially for the smaller foundry . . . offering low original cost and a distinct saving in operating cost . . . applicable to all classes of foundry work. Let a National Engineer show you how to step up production with a Simpson Mixer installation. Write for details.

CMD PNEUMATIC CORE TRUCKS



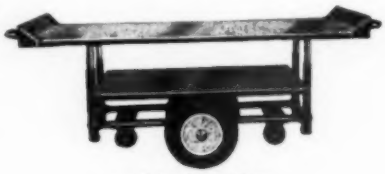
Model A-27

For the heaviest loads, this giant carrier is widely used. Heavy-duty elliptical springs and inner coil springs (in the upright supports)—an exclusive CMD feature—quickly absorb shocks and bumps. Bench high steel loading trays. Timken roller bearing disc wheels. Three sizes: 27″ x 60″, 800 lbs. capacity; 27″ x 72″, 1,000 lbs. capacity; and 27″ x 84″, 1,200 lbs. capacity.

SINCE 1925 foundries have been using CMD Pneumatic Core Trucks for fast, safe handling and delivering of cores from the core room to the foundry. The resilient construction of CMD Core Trucks and Core Barrows absorbs bumps and shocks, greatly decreasing core chafing and breakage. Reduce your costs from 50 to 75 per cent with this complete line of core room trucks and core barrows!

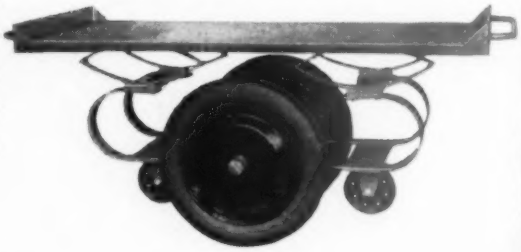
Model A-27-J

Elliptical springs and inner coil springs (in the upright supports) give correct resiliency under both light and heavy loads. Platform is 27″ x 60″. Load capacity is 600 lbs.



Model D-1

This moderately priced truck has two loading trays of heavy sheet steel, plus CMD inner coil springs and pneumatic tire wheels. Load capacity is 500 lbs.

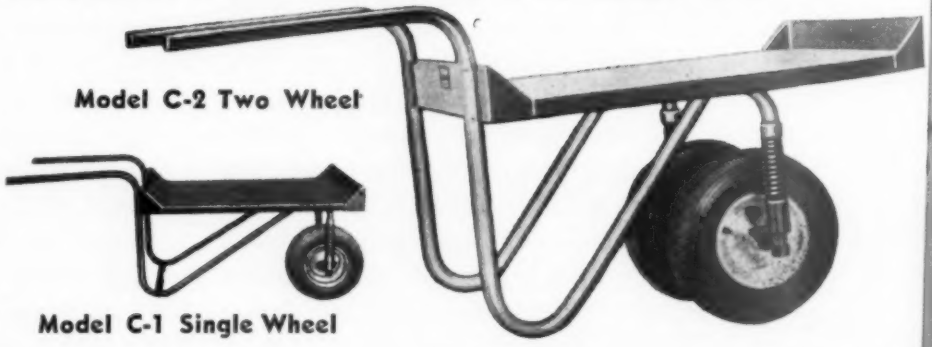


Model B-1

An intermediate elliptical spring arrangement plus pneumatic tire wheels give this truck extra cushioning protection. The resilient chassis is made of spring steel properly heat treated. Loading tray is 27″ wide, 72″ long. Load capacity is 700 lbs.

CMD PNEUMATIC CORE BARROWS

Ideal for moving cores to hard-to-get-into places around the foundry. Both barrows have pneumatic tires and inner coil springs in the uprights over the wheels. Loading top is 24″ wide — 40″ long. Overall length 66″—height unloaded 22″.



Model C-2 Two Wheel

Model C-1 Single Wheel

Write Today for Catalog of Complete Line of CMD Foundry Specialties!

S and CORE ROOM ACCESSORIES

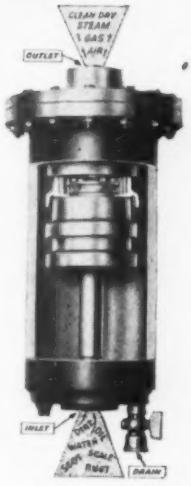
Model IG

CMD Tri-Purpose Core Trays

These core trays can be used for baking, stacking and carrying the cores. They eliminate transferring the cores from core plate to core tray. Their lock-stacking features allow storage from the floor up. They decrease core baking time—the heat radiates to the bottom of the core quickly, thus giving uniform core baking.

Model OG

To meet the demand for core trays with outside gussets, the model OG is available.



CMD TEXTITE Air Separator For Core Blowing Machines

The accurately rated capacities of CMD Textite Air Separators assure ample C.F.M. volume and safe delivery of clean and thoroughly dried air to your core blowing machines. Four sizes from 25 C.F.M. to 250 C.F.M. inclusive.

NEW CMD Core Maker's Bench

Four core makers can use this bench; two men on each side.

This Dual-Purpose Core Maker's Bench offers you many conveniences since the hopper can be loaded either by hand or from an overhead sand hopper. This saves one-third of your floor space. The bench is sturdily constructed for long and dependable use.

Specifications: sand capacity 1¼ cubic feet per lineal foot of bench; 40″ wide, 36″ high, 4″ wide tool shelves, 16″ deep working surface. Made of 10 gauge black sheet steel properly reinforced, entire construction arc welded and provisions made for bottom shelving. Standard stock lengths are 5′, 6′, 7′ and 8′. Longer benches made to order.

Write Today for Information on CMD Core Room Accessories!

CHICAGO MANUFACTURING & DISTRIBUTING CO.

Dept. F, 1928 West 46th Street Chicago 9, Illinois

51 "NATIONAL SECURITY CLAUSE" PLANTS

For Sale or Lease NOW

The offering of these properties under the provisions of the National Security Clause indicates their essential nature and sound worth.

1

Top-quality Properties

Each of these 51 facilities is a well-constructed, modern property—built during the war years, some equipped with the finest of machinery, tools and fittings. Some are general-purpose plants suitable for ready adaptation. Included, among others, are 12 aircraft and engine factories, 1 petroleum refinery, 4 chemical processing plants, 17 steel foundries, fabricating plants and forge shops, 9 shipyards and 2 brass and 5 light metals facilities.

2

At Favorable Locations

Some of these plants are located in the Atlantic seaboard states, many throughout the humming industrial midwest, south and southwest; others up and down the Pacific coast . . . in large cities and small towns . . . at deep-water ports; strategic locations, every one. Required raw materials are close at hand, profitable markets nearby, transportation facilities excellent and necessary utilities all available.

3

National Security Provision

These properties are offered for sale or lease with provisions for the national security, whereby the Federal Government retains dormant rights to utilize the facilities for production under Government contract. In the event that this dormant right is exercised, the Government will consider the qualifications of the buyer or lessee to carry out such contracts. This may well prove a great advantage to you!

4

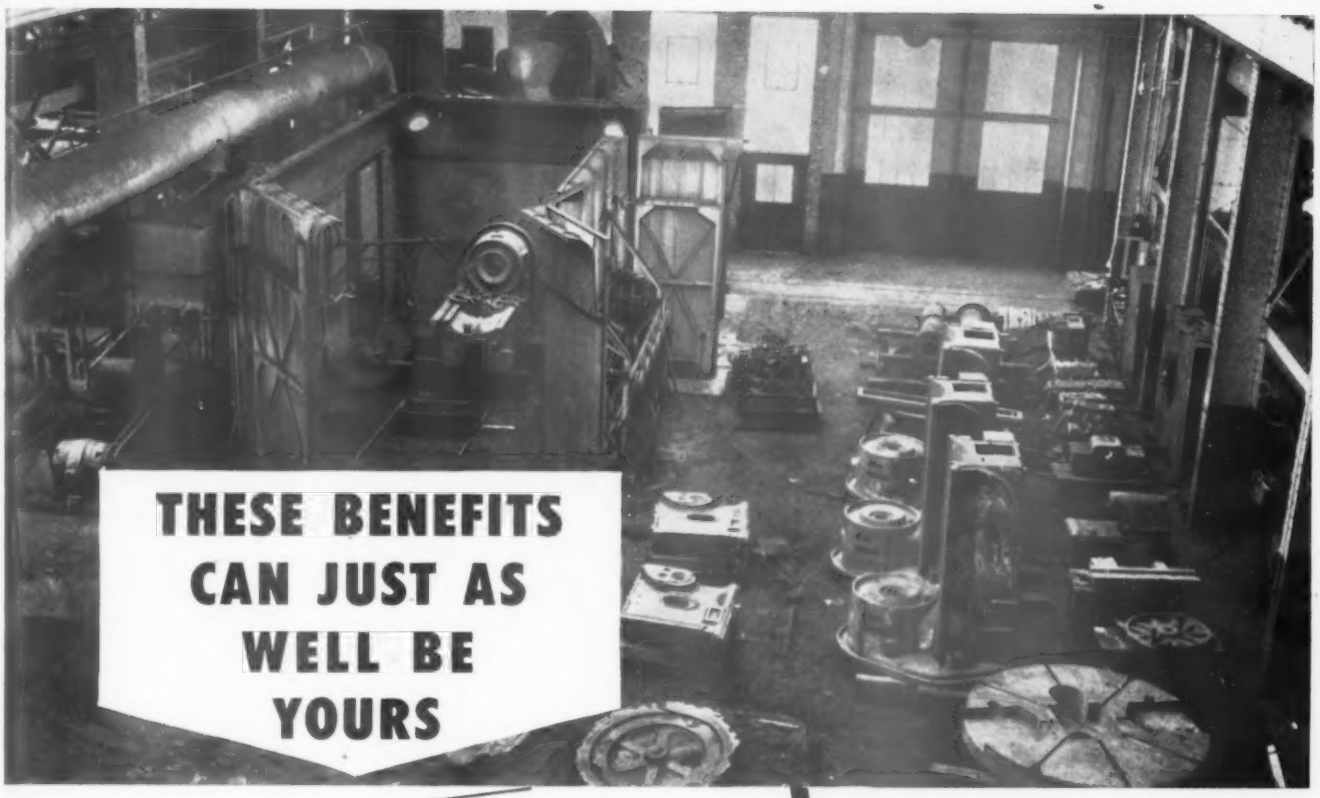
Write, Wire, Phone

These properties are offered for sale or lease, in whole, for continuing operation. Write, wire or phone for specific information and for necessary bid forms and helpful advice on how to bid. This advertisement is not a basis for negotiation. War Assets Administration reserves the right to reject any or all bids. Transfer of title will be subject to Executive Order 9908 relative to fissionable materials.

WAR ASSETS ADMINISTRATION
OFFICE OF REAL PROPERTY DISPOSAL
WASHINGTON 25, D. C.

GOVERNMENT WAA SURPLUS

1607-T



THESE BENEFITS CAN JUST AS WELL BE YOURS

THE JOHN BERTRAM & SONS CO. LIMITED
MACHINE TOOLS
DUNDAS, CANADA

BERTRAM

Dear Sirs:

The Hydro-Blast recently installed in our foundry has proved itself to be a very valuable unit.

Unsolicited, our foundry employees have expressed their appreciation for the elimination of dust while the cleaning work is in progress. Added to this, of course, is the saving we have made in removing cores and cleaning castings, over the method previously used.

By conservative estimate of average times for different types and sizes of castings, we have reduced cleaning time 40 per cent; and for cleaning our 42" Planer Bed casting, we reduced the time 65 per cent. We feel sure that as our men become more familiar with the technique of operating the Hydro-Blast, greater savings will be made.

Yours very truly,
THE JOHN BERTRAM & SONS CO., Ltd.

N. J. Dinelaggers
Vice President and General Manager

..... Nothing unusual about this—varying only in degree, it happens wherever and whenever Hydro-Blast is installed.

You'll find Hydro-Blast engineers good men to talk to, concerning your own cleaning and dust problems.

HYDRO-BLAST

Chicago 47, Illinois

2550 NORTH WESTERN AVENUE

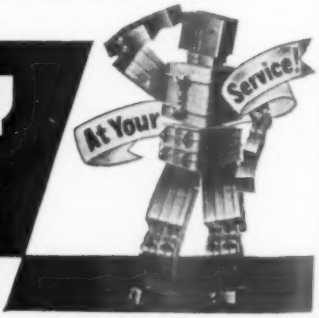
for a *Doubting* Thomas

Today's Sterling "LT" Flask built of special rolled channel steel . . . bent in one piece and welded at joint to form one solid, rigid piece. Steel trunnions are welded at ends or on sides, as desired. Handles do not interfere with rolling over sections while suspended on sling.

Sterling OFFERS VISUAL PROOF

Note the old, riveted Sterling Flasks in the above foundry scene. Unbelievable as it may seem, every Sterling shown here is a veteran of more than 15 years of hard, every-day service and each flask still has many years of service ahead . . . *visual proof* that Sterlings are soundly engineered and built for a long life of rugged foundry service.

Sterling FOUNDRY FLASKS

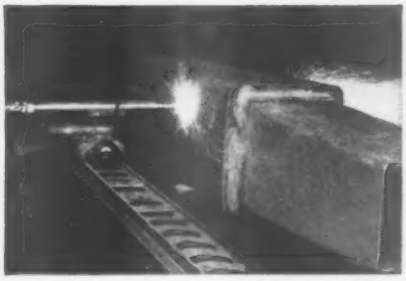


STERLING WHEELBARROW COMPANY • Milwaukee 14, Wis., U.S.A.

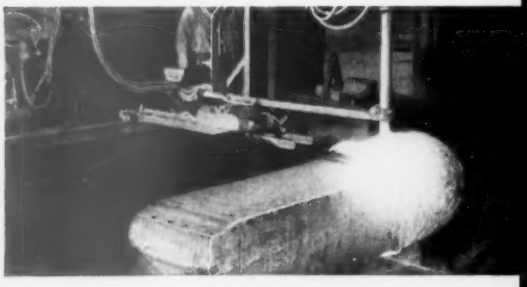
A 5251-1F

plays an important part. Furnace-tapping with the oxygen lance—oldest use of oxygen-cutting in steel plants—still saves time and reduces hazards.

Help on the Hot and Heavy Jobs



Ingots requiring 200 hours for mechanical "parting" have been split with the OXWELD C-45 heavy-duty blowpipe and then machined in 14 hours total time.



Cutting the hot top off this 26-inch forged slab with the C-45 blowpipe took less than 10 minutes and left the slab end square and undeformed.

The deseaming blowpipe, equipped with the OXWELD starting-rod feed, has reduced conditioning costs more than 50 per cent.

Draining furnace salamanders by oxygen-lance tapping has reduced furnace down-time more than three weeks in some steel plants.

LINDE service engineers who co-operate closely with the steel industry—have combined experience, knowledge, and practical "know-how" to help make better steel, faster, and at lower cost.

LINDE engineering service is always available to LINDE customers through the nearest LINDE office.

Linde

The words "Linde" and "Oxweld" are registered trade-marks of Units of Union Carbide and Carbon Corporation.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 East 42nd St., New York 17, N.Y. UCC Offices in Other Principal Cities

In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

You wouldn't hire 5 men to do the work of 4 . . .

A-C DOES IT FASTER • CHEAPER • BETTER

FASTER: Ease in using heavier electrodes with higher currents, and the ability to make excellent welds in all positions, assure higher speeds on all classes of work.

CHEAPER: "No-load" losses approximate 15% of d-c; pays for itself in power savings. 85% to 90% electrical efficiency as compared to 55% to 65% for d-c machines.

BETTER: Westinghouse A-C Welders eliminate magnetic arc blow—reduce spatter loss—permit welding of heavier sections—assure easy arc control and sounder welds.

WESTINGHOUSE

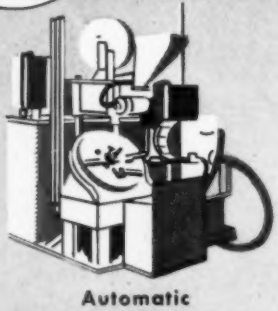
FOR SUPERIOR WELDING FLEXARC

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Manual Type A-C Welders
HC, WC-AC, WT-4, Farm Welder

1000 Amp
A-C Welder



Automatic
Welding Equipment

Single Operator
D-C Welders

Engine-Dri
D-C Welde

WHEN YOU SELECT AN A-C WELDER

GET THE RIGHT WELDER ...WITH THE CORRECT RATING

You wouldn't buy a 500-hp motor to do a 400-hp job. When you switch from d-c to a-c welding, you don't have to buy a 500-ampere a-c welder to replace a 400-ampere d-c machine.

Westinghouse offers a complete line of a-c welders . . . from the smallest to the largest. Each type and size is built to perform in accordance with its rating. For example, the Westinghouse Flexarc "65" 400-ampere A-C Welder is ample to do any job previously performed by a 400-ampere d-c unit. Ampere for ampere, it delivers rated output accurately, continuously . . . and, furthermore, it does this *faster, cheaper and better.*

With Flexarc A-C Welders, you can be sure of rated output in every instance . . . and you can get a rating to suit the job.

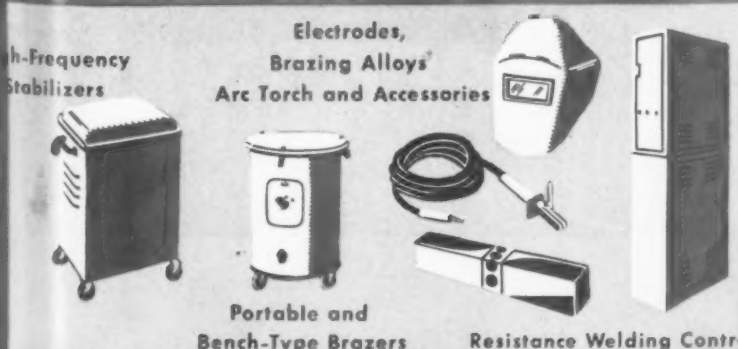
THE FLEXARC "65" GIVES YOU LOW VOLTAGE AND ARC STABILITY

The Flexarc "65" is the new *low-voltage* a-c welder with the *stabilized* arc. It's built to operate with an open-circuit secondary voltage of only 65 volts, and overcomes the problems of arc instability which formerly limited the use of lower a-c voltages for welding. It provides uniform, continuous current adjustment. Arc stability is assured over the entire operating range of welding current.

Flexarc "65" Welders are available in 200, 300, 400, 500 and 600-ampere ratings. For full details, see your nearby Westinghouse representative, or mail the handy coupon below. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-21452

EVERYTHING for Welding ANYTHING!



MAIL THIS COUPON

Westinghouse Electric Corporation
P. O. Box 868, Pittsburgh 30, Penna.

YES—send me details on the new Westinghouse "65" A-C Welder—also on items checked.

- ☐ Automatic Welding Equipment
- ☐ Engine-driven Welders
- ☐ HF Stabilizers
- ☐ Brazers
- ☐ Electrodes
- ☐ Resistance Welding Control
- ☐ D-C Welders

Name _____

Company _____

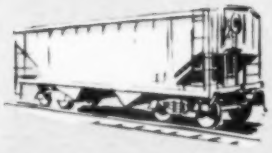
Address _____

ONLY 0.10 per cent VANADIUM increases

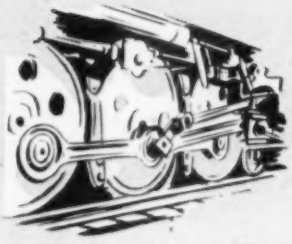
STRENGTH
DUCTILITY
WELDABILITY
ABRASION RESISTANCE
TOUGHNESS

in MANGANESE-VANADIUM steels

Manganese - vanadium steel is especially suitable for ship construction because of its high tensile strength, ductility, and good weldability.



Manganese - vanadium steel provides high strength for underframing, end sills, and side frames for railroad gondola cars.



Bell cranks, radius bars, and other vital parts of high-speed locomotives that must be strong and tough, are made of manganese - vanadium steel of medium-carbon content.

Crankshaft forgings, which must have exceptionally high strength, are made of steel containing vanadium.

Low-carbon, manganese-vanadium steel has high strength and ductility in the as-rolled condition. This steel also has particularly good weldability because of the fine grain imparted by vanadium, and its low carbon content. Welds in this steel show little tendency toward air-hardening, and retain strength and ductility almost equal to that of the original plate.

Following is a typical analysis for low-carbon, manganese-vanadium steel plate and rolled products. This composition is suitable for many applications where a low-alloy, high-strength steel is required. Note the excellent properties of this steel.

TYPICAL MANGANESE-VANADIUM STEEL ANALYSIS

Vanadium	0.08 to 0.12%
Carbon	0.11 to 0.16%
Manganese	1.20 to 1.45%
Silicon	0.15 to 0.30%

AVERAGE PROPERTIES

Tensile Strength	85,000 to 95,000 psi.
Yield Point	55,000 to 72,000 psi.
Elongation in 2 in.	18 to 27%
Reduction of Area	50 to 70%

Our metallurgists have had a great deal of experience over the years in the application of alloy steels. They will gladly help you select the right steel for a particular job. If you wish assistance, consult our Technical Service Department. There is no charge for this service.

ELECTRO METALLURGICAL COMPANY

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

ELECTROMET Ferro-Alloys and Metals are sold by Electro Metallurgical Sales Corporation, 30 East 42nd Street, New York 17, N. Y., and Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

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Toughest Grinding Jobs are Easy
with NEW Polyphase
SKIL Grinder

Waste metal on welds and castings almost melts away when you put *New* Polyphase SKIL Grinder on tough surfacing jobs. It's direct-driven and super-powered with a rugged 3-phase, 220-volt motor. Maintains maximum speed even under heavy load in continuous duty grinding, sanding and wire brushing. Side handle easily mounted for right or left hand operation. Sturdily built for long trouble-free service with the wide variety of accessories available. If you want more speed *at less cost* on difficult surfacing . . . ask your SKIL Tool Distributor to demonstrate the *New* Polyphase SKIL Grinder today.

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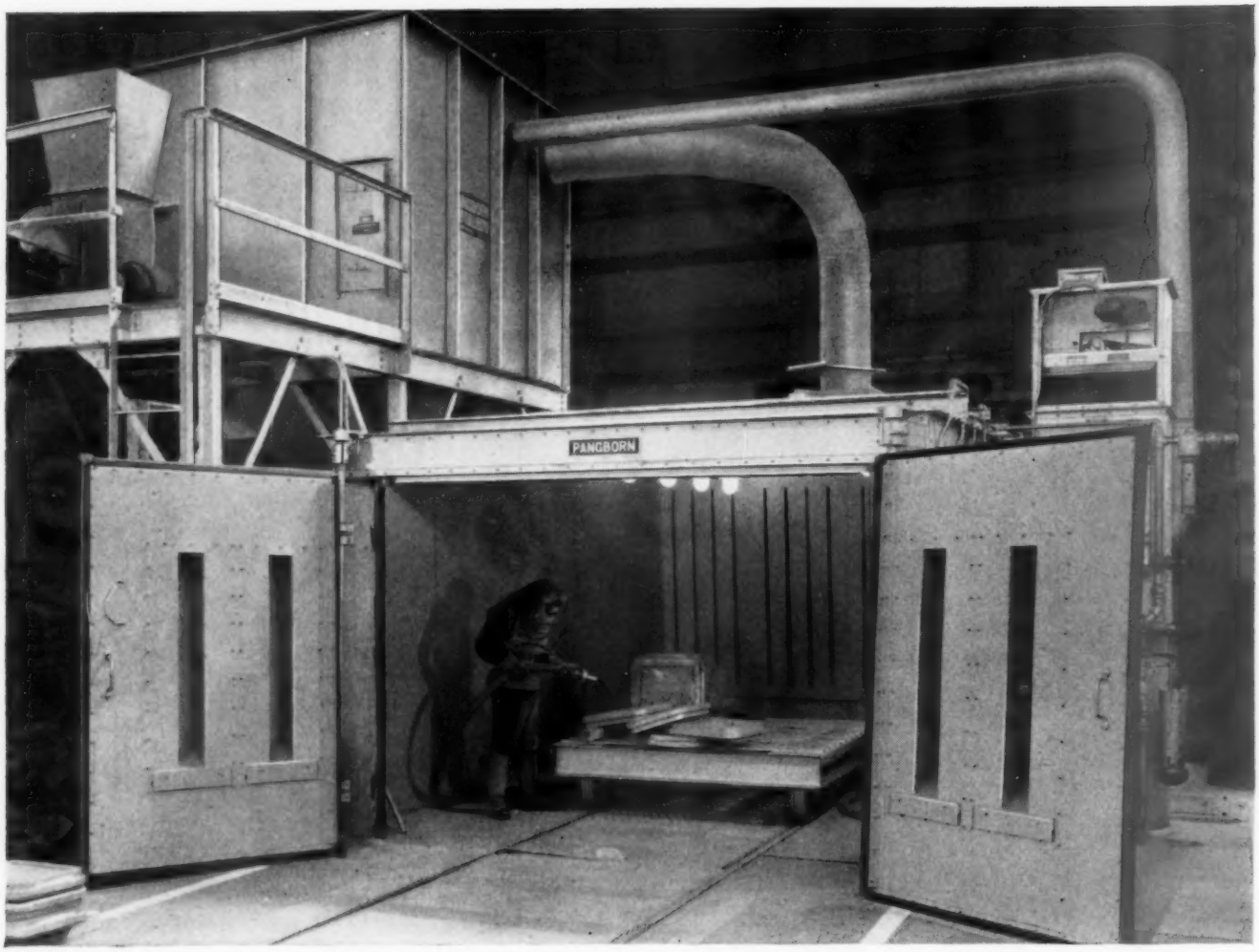

Here's Pangborn Teamwork for Better Blast Cleaning

COUPLE Pangborn Blast Cleaning with Pangborn Dust Control and you get an unbeatable combination for fast, superior, dustless blast cleaning operations.

Here the Pangborn Air Blast Cleaning Room is coupled to a Pangborn Dust Control System for faster, more economical cleaning of heavy plate at Montreal Locomotive Works Limited, Montreal, Quebec, Canada.

Pangborn Air Blast Cleaning Rooms are built to the size and shape your cleaning task requires. They are quickly loaded and unloaded from either end by means of a work car or overhead conveyor. Proper illumination gives the operator maximum visibility for his work. Automatic abrasive recovery allows immediate re-use of cleaned, separated abrasives . . . and, Pangborn Dust Control keeps the rest of your plant clean from abrasive or metallic dusts.

For years Pangborn has provided the right Blast Cleaning equipment to foundries for smoother, more practical cleaning operations. Write today for complete information about Pangborn Air Blast Cleaning Rooms, other Pangborn Blast Cleaning Equipment, *and* Pangborn Dust Control. PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.

Over 25,000 machines serving industry

Pangborn

BLAST CLEANS CHEAPER with the right equipment for every job

CUTS GRINDING COSTS 30%

THE load on the compressor in this fabricating shop had increased so much the pressure *at the tools* was sometimes as low as 40 lbs. with consequent loss in production. A new compressor would have cost $5000. The Rotor Application Engineer suggested High Cycle Grinders to relieve the load on the compressor, and they were purchased with the following results:

Cuts grinding time 30% because of faster wheel speeds, saving enough to pay for installation in 11 months.

Saves $3800 on first cost. Frequency converter cost $1200, compared to $5000 for air equipment.

Reduces power cost 75%. Air system would have required 60 hp. High Cycle requires 15 hp.

Shall we study your production for similar benefits?

HI-CYCLE O'TOOL

THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

Sincerity
YOUR THIEM REPRESENTATIVE

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• No ordinary salesman is your Thiem representative. He is a skilled specialist — wise in the ways of foundry practices — and he's eager to work *for* you and *with* you in solving your core wash and mold coating problems. Laboratory-controlled every step of the way, consistently uniform and unquestioned in quality, all Thiem products are *sold with service.* This special service is offered to give you the greatest possible benefit from Thiem core washs and mold coatings.

THIEM

Next time your Thiem representative comes to call, bid him welcome. He has the products and the know-how to help you cut costs, speed operations—*do a better job in less time!*

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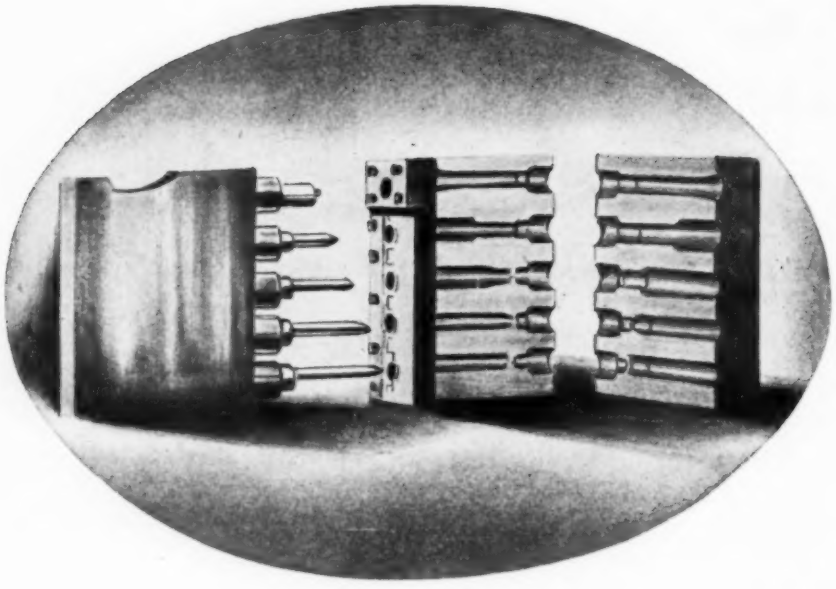
PRODUCTS, INC., MILWAUKEE 4, WISCONSIN

Manufacturers of Foundry Products Exclusively

KROME KOTE • FERRO KOTE • MOLD LITE • INGOT KOTE • NODRI MOLD SPRAY • FERRO-GLAZE FLUX • CHILL-KOTE • SYNOL • CORE-BINDERS

High Temperature Lubrication . . . 400° F. and up!



In deep piercing operations, die lubrication with a durable **"dag"** colloidal graphite dispersion produces smooth forgings to close tolerances . . . reduces die damage.

Not only in piercing, but for countless other high temperature operations requiring lubrication versatile **"dag"** colloidal graphite dispersions provide a unique combination of properties. Let Acheson Colloids' engineers study your problem . . . **"dag"** colloidal graphite may be the solution! Check the coupon and mail.

Acheson Colloids Corporation, Port Huron, Michigan; Boston; New York; Philadelphia; Pittsburgh; Cleveland; Detroit; Chicago; St. Louis; Los Angeles; San Francisco; Toronto.

Send us a booklet on:

- General lubrication ☐
- Extreme (high or low) temperature lubrication ☐
- Parting ☐
- Impregnation ☐
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40th Anniversary Year

Acheson Colloids Corporation

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HOUGH PAYLOADER

SAY "HUFF"

PATENT 2,412,323

Saves 60 Man Hours per day

Saves more than its first cost and operating charges in 6 months

A Model HA Payloader, in the foundry of George D. Roper Company, leading stove manufacturer, operates only four hours a day doing work that formerly required 60 man hours of labor, and releases 5 men for other essential work.

Hundreds of other foundries have also found there's profit in Payloaders, by savings in labor, time and costs and in increased production. Speedily twisting, turning and traveling, Payloaders go in and out of box cars and bins, up and down ramps, through narrow doorways and aisles . . . unload, load, transport and dump sand, slag, scrap, castings, coke and other bulk materials. They do quickly and easily many material handling tasks that are now slow, laborious and costly.

It will pay you to investigate the advantages of Payloaders for your own foundry. Get the facts on these modern material handling miracle workers.

Job Data:

Model HA Payloader at George D. Roper Company

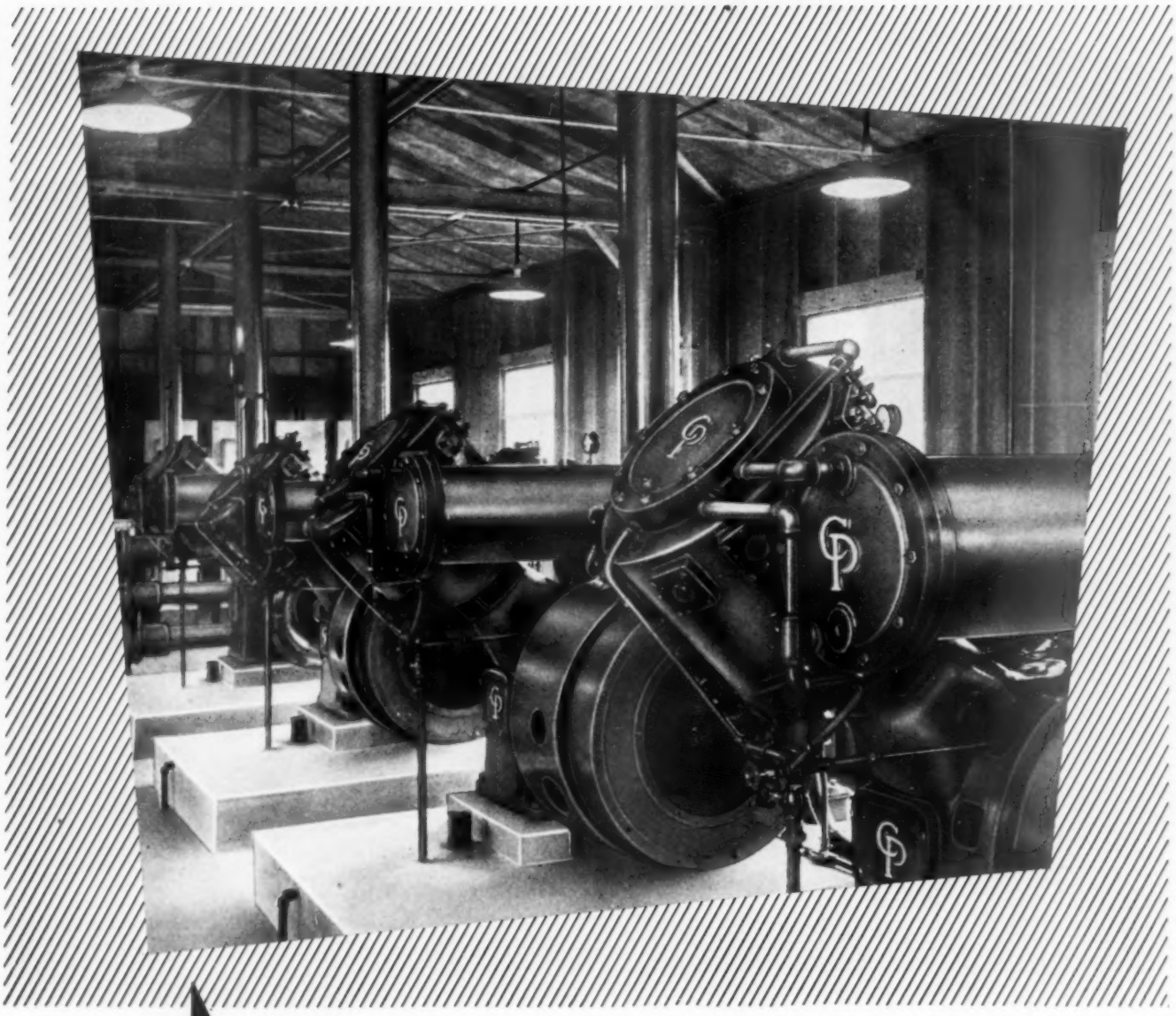
- Windrows 288 tons of sand for cutting each night in 1½ to 2 hours.
- Delivers 30 tons of new sand from bins 250 feet distant in 1½ hours — formerly a 15 man-hour job.
- Moves castings from foundry to mill room — a 300 foot round trip.
- Does general clean-up work.
- Hauls discarded sand to the dump.

SEND TODAY for literature on the 10½ cu. ft. Model HA Payloader, the ¾ yd. Model HF, the 1¼ yd. Model HL, also the 2 yd. Payloader Buggy.

THE FRANK G. HOUGH CO.

703 SUNNYSIDE AVENUE • LIBERTYVILLE, ILLINOIS

TRACTOR SHOVELS SINCE 1920



It's easy to install!

TYPE Y COMPRESSOR

Shipped intact as a "package unit," ready for external connections, a CP Type Y Compressor can be set up quickly with minimum expense. It needs only a simple foundation, and requires no special skill to align and install it. Its compact design renders it ideal where floor space is restricted.

It operates at high efficiency with low maintenance because of such features as large area Simplate valves . . . multi-step capacity regulation . . . effective inter-cooling . . . precision bearings . . . force-feed lubrication.

Available with built-in or direct-coupled motor, or with V-belt drive, in capacities of 500 to 900 c.f.m., at 80 to 125 pounds pressure. Sizes for other pressures also furnished. Write for full information.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

HERE'S HOW...

CHICAGO TRANSIT AUTHORITY
CUTS MELTING TIME IN HALF
. . . cuts fuel cost 50% . . . cuts metal losses 40%

Chicago Transit Authority, one of the world's largest transportation systems, operating 2,400 streetcars, 1,625 elevated cars, and 1,100 buses, installed a Fisher oil fired Simplex Melting Furnace for remelting, reclaiming scrap, brass, and bronze. Journal and axle bearing brasses and worn parts from all types of rolling stock are melted down and recast into new parts.

The new Fisher Simplex replaces a conventional oil fired spherical type open flame furnace. Check this "Before and After" story of faster melting, lower fuel cost, and lower metal losses.

	BEFORE	AFTER
Heating time 1000 lb. charge	2½ hrs.	1 hr.
Fuel cost per pound melted	$.0056	$.0027
Metal Loss	5%	3%

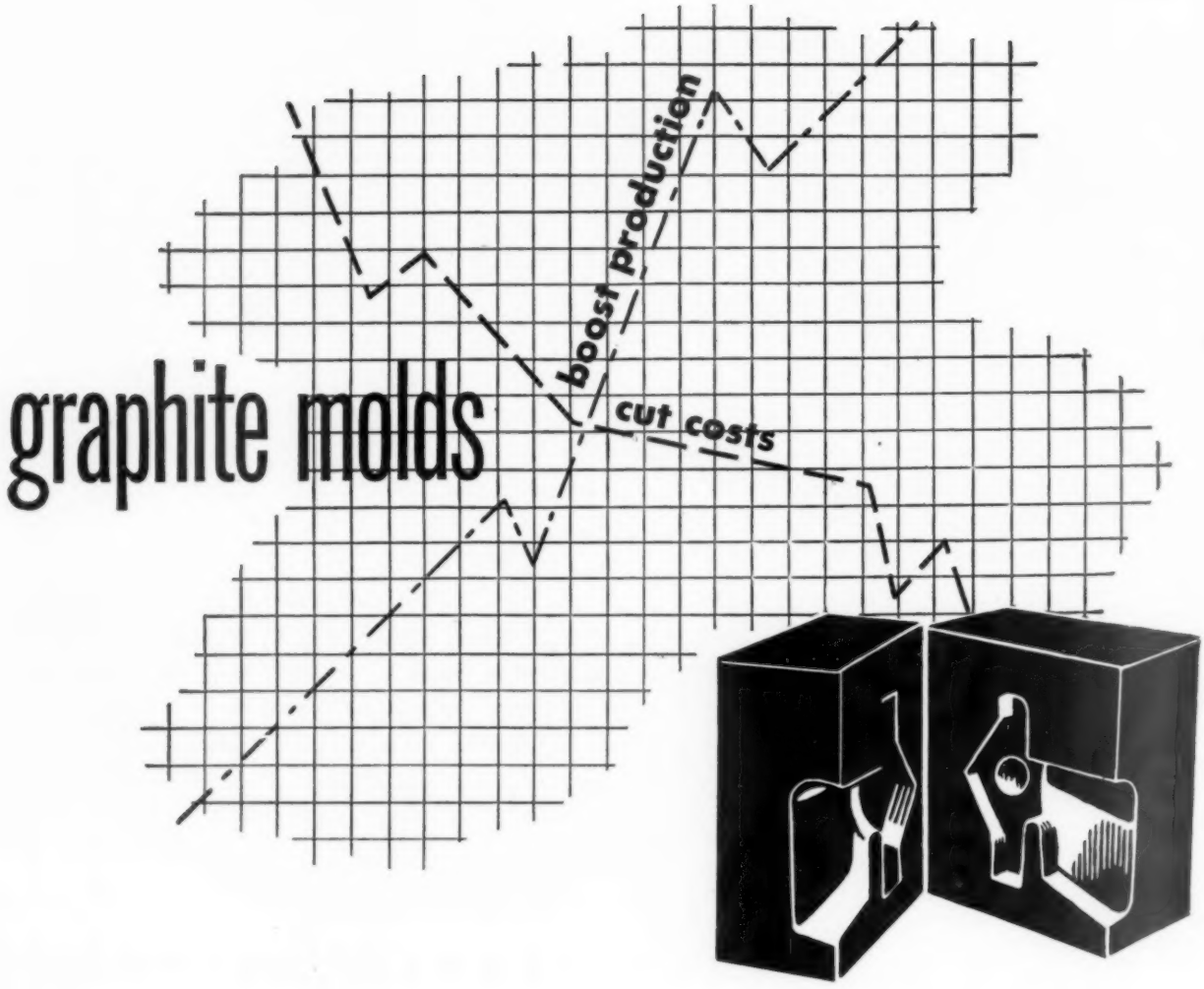
Ask for bulletin #28-A "Fisher Simplex Furnaces."

FISHER ADVANTAGES

Furnace charges *easily* from front at convenient height. . . . More metal can be charged as bath occupies but a *fraction* of melting chamber . . . Uses open flame reverberatory melting, the *fastest* fuel fired melting method . . . Two section furnace shell removable for *easy* relining.

Fisher Furnaces

A DIVISION OF LINDBERG ENGINEERING CO.
2453 West Hubbard Street, Chicago 12, Illinois



You get faster stripping because your castings won't stick to graphite molds. You don't need a mold wash. Graphite molds retain their physical shape even at extreme temperatures. You also get faster, more uniform cooling — and better castings.

Find out how graphite gives you greater return per dollar invested for molds. Let International's engineering staff analyze your ferrous and non-ferrous casting operations and select the right grade of graphite for you.

International supplies graphite in blocks, slabs and tubes—or machined to your blueprint specifications.

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ELECTRODES—*for electrothermic and electrolytic use* • MOLD PLUGS • GRANULAR GRAPHITE • GRAPHITE SPECIALTIES

FREE — handy booklet containing engineering data on graphite. Write today.

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ST. MARYS. PA.

SPEED UP

those clean-up jobs,

with a Thor

Model 7B with push throttle. Also available with button or lever throttles.

pneumatic

WELD FLUX SCALING HAMMER

This power-packed Thor Hammer saves time and money on many jobs. Use it for fast, low-cost removal of flux after welding, chipping, chiseling, scaling, etc. Its got plenty of speed and power for quick, better results. Air blast keeps work surface visible by blowing away chips, scale and dirt. *Ask your nearest Thor branch to arrange a demonstration.*

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Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

COLEMAN TOWER* Ovens

"PROVE MORE DEPENDABLE...MORE ECONOMICAL..."

says H. S. GULICK of The New York Air Brake Company

"Our Coleman Tower Oven has been in operation continuously twenty to twenty-four hours per day, seven days per week...which certainly proves its dependability under uninterrupted operation.

Coremakers and oven tenders prefer this equipment because of its lessened heat exposure and the fact that the cores come through the unloading position free from smoke and fumes.

We prefer the Tower Oven because the resultant cores are more uniformly baked than with any other equipment we have ever used, and, hence, our spoilage is less and, our entire operation is more economical."

Hundreds of other foundries have also increased coreroom production at lowered cost with Coleman Tower Ovens. Here's why:

PATENTED OPEN CENTER: Provides close, efficient grouping of coremakers around the oven. The exclusive 3-way loading feature increases accessibility 300% over ordinary vertical oven designs. Cuts carry time... increases productivity.

AMAZING FLOOR SAVING: The elimination of racks, aisleways, and large working space required by batch ovens permits saving up to 75% in floor area. Less space . . . greater output.

PERFECT BAKING: The Coleman heating system produces perfectly baked cores with unusual speed. Eliminates rejects and make-overs.

RECUPERATIVE COOLING SYSTEM: Cores are "smoked off" and cooled before they reach the unloading station, making for better working conditions. The heat recovered from the cores is used over again, resulting in large fuel savings.

WRITE TODAY FOR BULLETIN 48

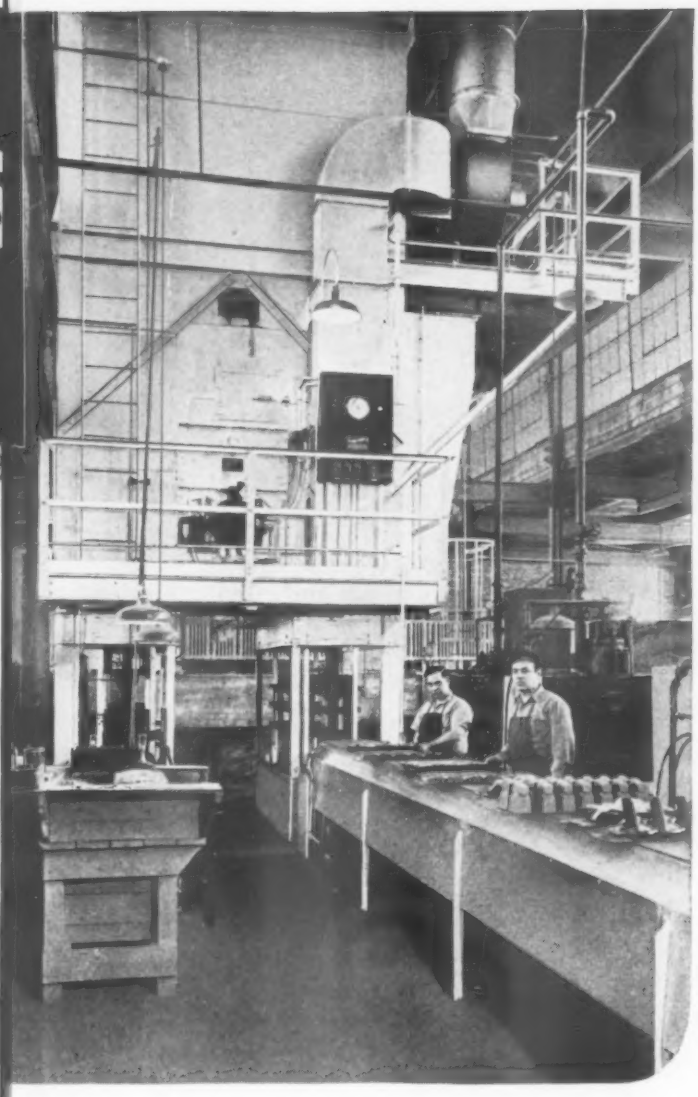
*Trademark Reg. U. S. Pat. Off.

COLEMAN TOWER OVENS ARE AVAILABLE IN A WIDE RANGE OF SIZES AND CAPACITIES FOR VARIOUS PRODUCTION NEEDS, ASSURING DEPENDABLE PERFORMANCE AT LOWEST POSSIBLE COST

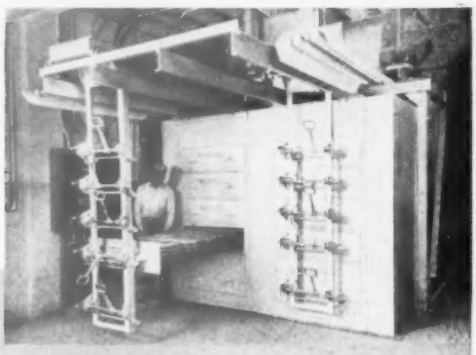
The FOUNDRY EQUIPMENT CO

CLEVELAND 13, OHIO, U. S. A.

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

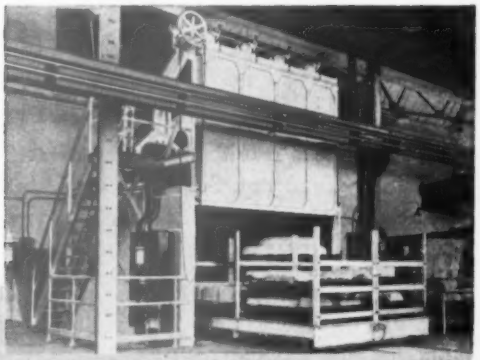


THERE ARE MANY OTHER TYPES OF COLEMAN OVENS SUITED TO THE CORE BAKING AND MOLD DRYING REQUIREMENTS EXISTING IN YOUR OWN FOUNDRY



★ **COLEMAN ROLLING DRAWER OVENS**
For small and medium cores. High-speed production with limited floor space.

★ **COLEMAN TRANSRACK OVENS**
For use with portable racks to reduce handling labor. Very efficient where ample floor space is available.



★ **COLEMAN CAR-TYPE OVENS**
For baking large cores or drying molds. Coleman Car-Type Ovens are used by most of the leading producers of heavy castings.

A FEW REPRESENTATIVE COLEMAN TOWER OVEN OWNERS

Landers, Frary and Clark
Lynchburg Foundry Co.
Ferro Machine & Foundry Co.
Grede Foundries, Inc.
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COLEMAN HEATING SYSTEMS USE THE MOST ECONOMICAL FUEL AVAILABLE TO YOU: GAS, OIL, STOKER-COAL, ELECTRICITY, ETC.

COMPANY
BUILDERS OF COLEMAN AND SWARTWOUT OVENS

MEMBER MANUFACTURERS ASSOCIATION INC. FOUNDRY EQUIPMENT

COLEMAN
CORE AND MOLD OVENS

OVER 9000 SUCCESSFUL INSTALLATIONS

Porcelain-enameled ware leaving Gas-fired continuous oven in which porcelain is fused on steel.

CONTINUOUS GAS FURNACES

Expedite Porcelain-Enamelling Operations

Continuous GAS furnaces, installed in the production lines, expedite finishing operations at Strong Manufacturing Company, Sebring, Ohio. In this finishing cycle, porcelain enamel is fused on steel as the press-formed units pass through high-temperature chambers.

This application of GAS is another typical example of the use of modern Gas Equipment right in the production line, to take full advantage of time-saving and labor-saving characteristics of this ideal industrial fuel. The results are typical, too—

- Uniform heat reduced number of rejects.
- Furnace life increased 100% over furnace using previous fuel.
- Reduction in fuel cost per enamelled unit.
- Increased lustre in porcelain due to plant cleanliness.
- Automatic heat control permits productive use of furnace overload capacity.

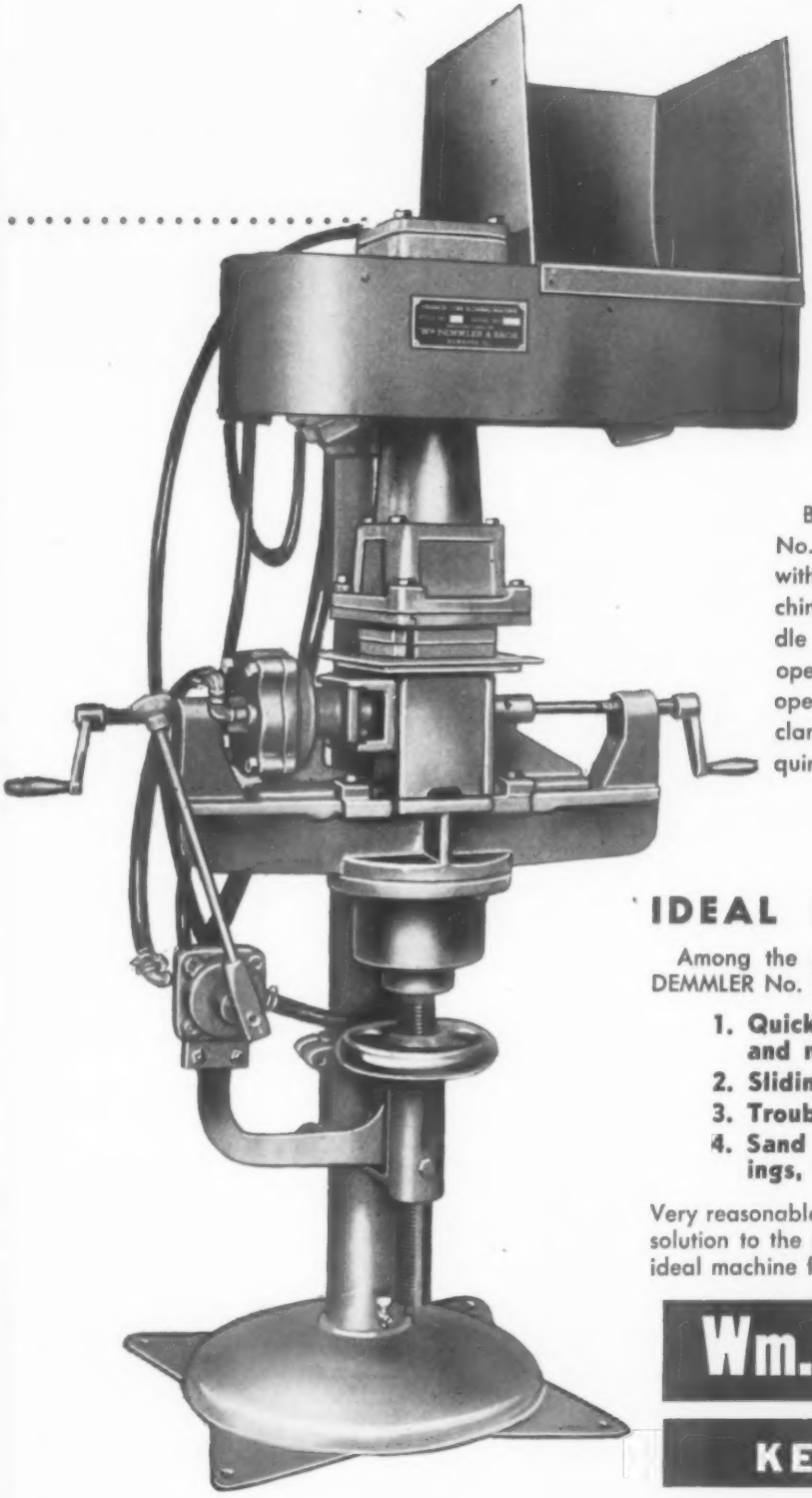
In every industrial process requiring heat there's a place for GAS and modern Gas Equipment. And in most of these processes the Gas Equipment can be placed right in the production line to take full advantage of the flexibility and economy of GAS. Your local Gas Company Representative will show you how it's done.

AMERICAN GAS ASSOCIATION
420 LEXINGTON AVENUE, NEW YORK, N.Y.

MORE AND MORE...
THE TREND IS TO GAS
FOR ALL INDUSTRIAL HEATING

DEMMLER Core Blower

NO. 55



A FAST CORE BLOWER EVERY FOUNDRY NEEDS AND CAN AFFORD

Because of its many features, the new Demmler No. 55 Core Blower was quick to gain popularity with foundrymen everywhere. This versatile machine will accommodate boxes 9 inches long—handle cores weighing up to 3 pounds. Sand magazine opening is 4½ by 9½ inches. A single hand valve operates both vertical and horizontal core box clamps and blows the core. Only 3 seconds required for complete cycle!

IDEAL FOR SHORT RUN JOBS

Among the many high quality features found on the new DEMMLER No. 55 are:

1. **Quick, easy adjustments for raising the table and moving chuck jaws.**
2. **Sliding, quick change blow plates**
3. **Trouble-free diaphragm type blow valve**
4. **Sand magazine and carriage of aluminum castings, with ball bearing rollers**

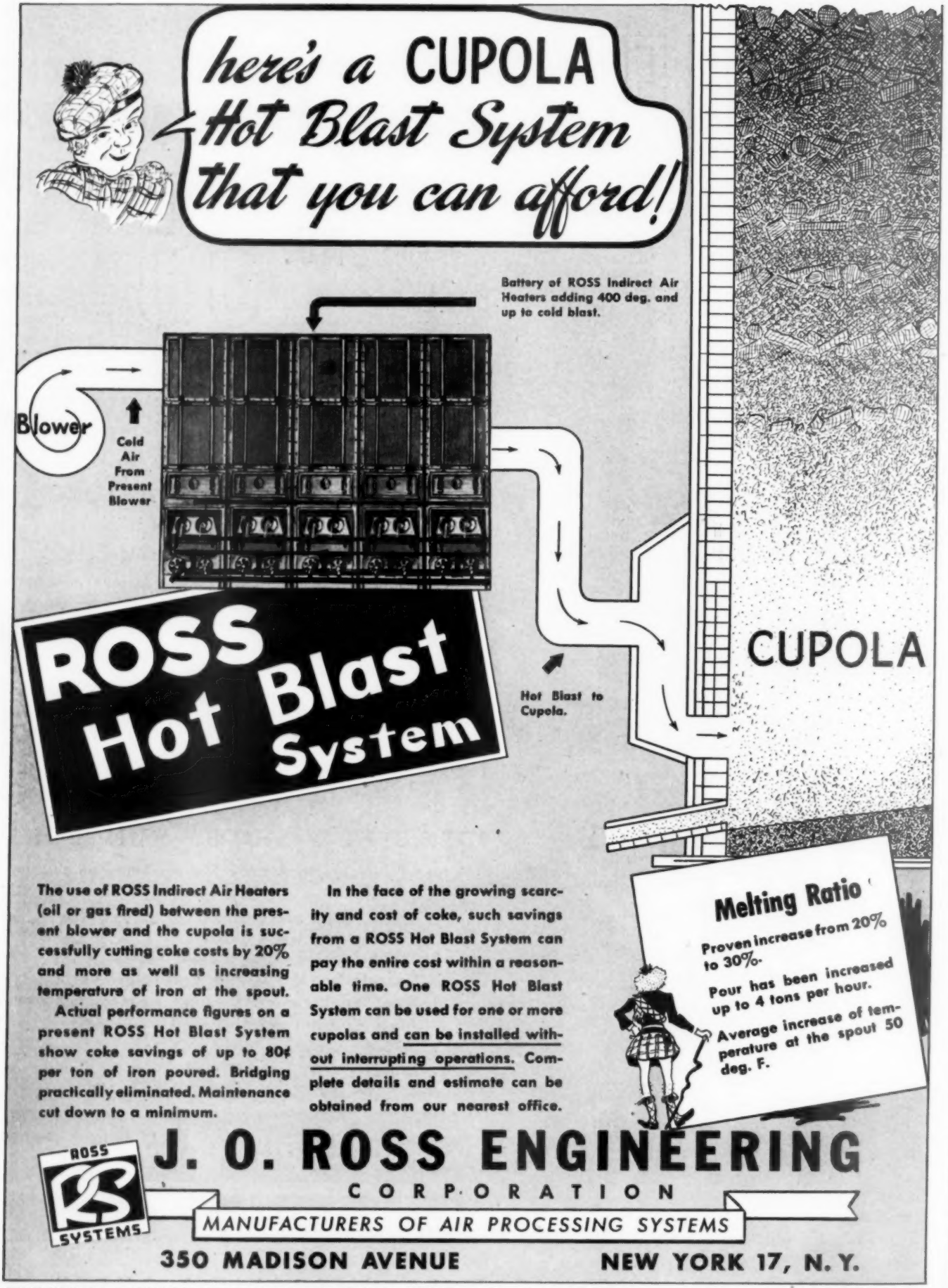
Very reasonable in price, the DEMMLER No. 55 is the economical solution to the rapid production of high quality small cores—an ideal machine for any foundry whether large or small.

Wm. Demmler & Bros.

KEWANEE, ILLINOIS

SEND FOR ILLUSTRATED SPECIFICATION SHEET

here's a CUPOLA Hot Blast System that you can afford!


Battery of ROSS Indirect Air Heaters adding 400 deg. and up to cold blast.
Blower
Cold Air From Present Blower
CUPOLA
Hot Blast to Cupola.

ROSS Hot Blast System

The use of ROSS Indirect Air Heaters (oil or gas fired) between the present blower and the cupola is successfully cutting coke costs by 20% and more as well as increasing temperature of iron at the spout.

Actual performance figures on a present ROSS Hot Blast System show coke savings of up to 80¢ per ton of iron poured. Bridging practically eliminated. Maintenance cut down to a minimum.

In the face of the growing scarcity and cost of coke, such savings from a ROSS Hot Blast System can pay the entire cost within a reasonable time. One ROSS Hot Blast System can be used for one or more cupolas and can be installed without interrupting operations. Complete details and estimate can be obtained from our nearest office.

Melting Ratio

Proven increase from 20% to 30%.

Pour has been increased up to 4 tons per hour.

Average increase of temperature at the spout 50 deg. F.

ROSS SYSTEMS

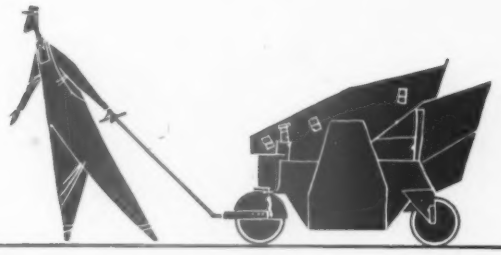
J. O. ROSS ENGINEERING CORPORATION

MANUFACTURERS OF AIR PROCESSING SYSTEMS

350 MADISON AVENUE NEW YORK 17, N. Y.

201 N. Wells Street, CHICAGO-6 • 79 Milk Street, BOSTON-9 • 9225 Grand River Avenue, DETROIT-4 • 1231 E. Seventh Street, LOS ANGELES-21
ROSS ENGINEERING OF CANADA, LIMITED, MONTREAL 19, CANADA • CARRIER-ROSS ENGINEERING COMPANY, LIMITED, LONDON, ENGLAND

you can take it with you



Simplicity Portable Screening and Conditioning Units

GO ANYWHERE

SPEED PRODUCTION

Portable screening and conditioning units are designed for operation in those parts of a foundry not equipped with sand systems. The 2′ x 3′ model illustrated here will screen, aerate and fluff into finely prepared sand all that two men can shovel. Mounted on cast aluminum, rubber tired, roller-bearing wheels for easy handling. It uses a 3 h.p. motor, has a shoveling height of 25½″, overall width of 40¾″, and overall length of 88¾″. Also available is a 12″ x 18″ portable unit of about half capacity of one described.

* SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A. o FOR CANADA:
* CANADIAN BRIDGE ENGINEERING CO., LTD., WALKERVILLE, ONTARIO.
* FOR EXPORT: BROWN & SITES, 50 CHURCH ST., NEW YORK 7.

Simplicity
TRADE MARK REGISTERED

ENGINEERING CO., DURAND, MICHIGAN

Leggings Foundrymen Like!

AO #1512

CUTAWAY VIEW

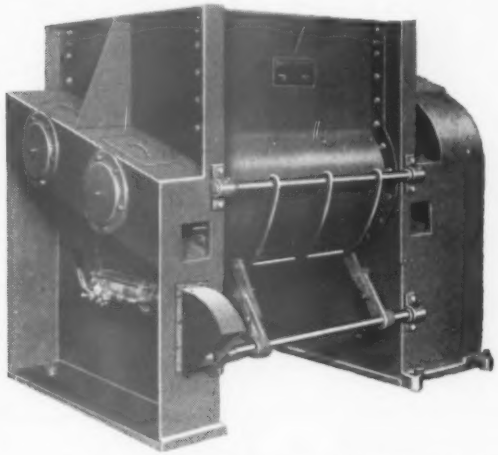
This legging, which may be had in chrome-tanned cowhide, asbestos or flame-resistant duck, is popular with workers because its spring steel construction keeps the legging away from the leg, thus providing more comfort through greater ventilation. It fits securely at ankle and below knee and protects lower leg, ankle and instep from heat, sparks and hot metal splashes met with in welding, burning and cutting...and from the extreme heat of pouring, ladling, melting and furnace work. For protection against the small sparks in bench work, assembly work and spot welding, it does a similar A-1 job. Easy to put on or take off. Your nearest AO Safety Representative can supply you.

American Optical
COMPANY
Safety Division

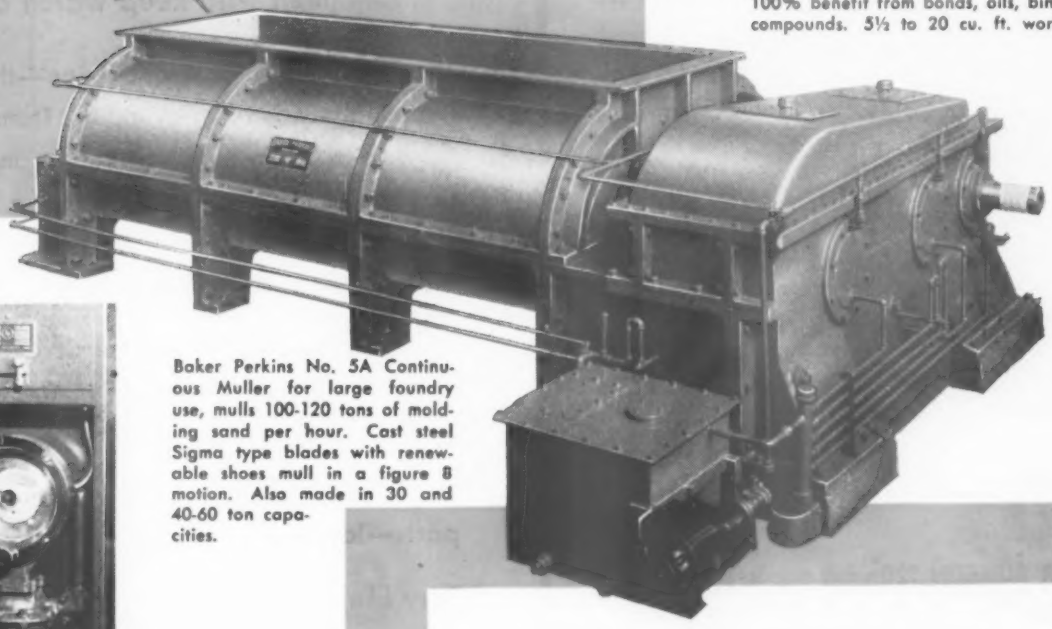
SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

FOR BETTER CASTINGS, USE BETTER SAND MIXERS

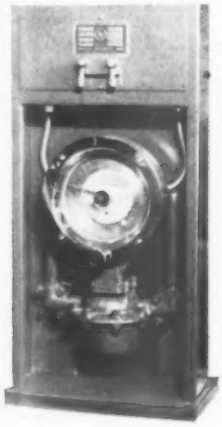
One sure way to produce better castings is by improving your core sand. Baker Perkins foundry equipment can help you do this important job. Baker Perkins continuous mullers, batch-type core sand mixers, liquid meters, and traveling sand scales are doing an efficient job in a great many of America's most successful foundries. Any one or all of these units may be integrated into your production system to help you reduce the percentage of faulty castings and thus help increase your profits. Our engineers will be glad to study your requirements and make specific recommendations.



Baker Perkins "Unidor" Core Sand Mixer. Rubs, stirs, and kneads in one operation. Distributes a thin layer of bond around each grain, assuring 100% benefit from bonds, oils, binders, and other compounds. 5½ to 20 cu. ft. working capacities.



Baker Perkins No. 5A Continuous Muller for large foundry use, mulls 100-120 tons of molding sand per hour. Cast steel Sigma type blades with renewable shoes mull in a figure 8 motion. Also made in 30 and 40-60 ton capacities.



Baker Perkins Liquid Meter for accurately and automatically measuring water or binding oil flowing into each B-P Core Sand Mixer. Simple! — just dial the amount of liquid desired and the control mechanism does the rest. Capacities up to 600 lbs.

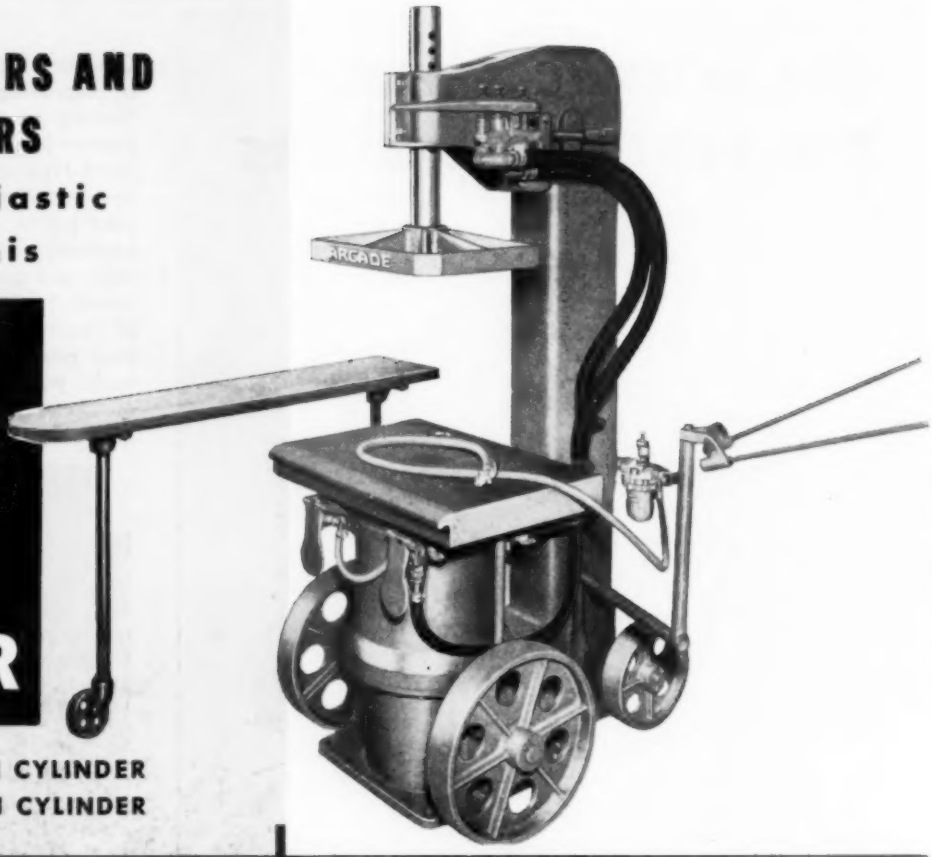
BAKER PERKINS INC.

FOUNDRY EQUIPMENT SALES

SAGINAW, MICHIGAN

Both MOLDERS AND MANAGERS are enthusiastic about this

NEW ARCADE JOLT SQUEEZER



No. 100 WITH A 10-INCH CYLINDER
No. 120 WITH A 12-INCH CYLINDER

"Best machine I ever used!"
says every molder who has used it.

They like the way it minimizes manual effort required to produce the maximum number of molds.

They like the attention given to details that make for easier handling of molds.

They like the ease with which the balanced arm swings back and forth at a light touch.

They *like* it!

WRITE FOR BULLETIN 120—full details; and continue to expect important developments at Arcade.

Production men like it, too—
men who keep watch of costs.

They like its flexibility of design—the interchangeability of cylinders, from 10-inch to 12-inch or vice versa; and the easy switch from portable machine to stationary, by removing the wheels and bolting down; or vice versa.

They like the rugged construction and clean simplicity—a machine built to stand up throughout a long, economical life.

They like its minimum number of working parts—low maintenance.

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50 years of continuous molding machine manufacture

ARCADE

MANUFACTURING DIVISION
ROCKWELL MANUFACTURING COMPANY
FREEPORT, ILLINOIS

Control Over Quality And Costs Paramount

FOR THE last three years foundrymen have encountered many difficulties in meeting tremendous demands for castings. While the end of the war eased the problem of manpower supply, new headaches were produced by shortages of both metallics and fuel.

A tight pig iron situation has necessitated a constant scramble for enough pig to keep foundries running. Curtailment in the amount of iron available to foundries due to a variety of causes including blast furnace breakdowns, the need for more iron in the production of ingots, government interference, and a changing distribution pattern, has resulted in some slackening in foundry operation, an increase in castings losses as shops try to use exceptionally high percentages of scrap, and renewed pressure by some groups for allocations of pig iron. Need for metallics has pushed scrap prices to fantastic levels. Strikes in the coal fields and an inadequate coke oven capacity have kept foundry operations near the shutdown stage for many months.

While these difficulties are most pressing at the moment, two factors resulting in part from the raw materials supply situation may have a more adverse effect on the future of the industry. If foundrymen expect to be successful in the period of intense competition which must lie ahead, serious attention should be given now to the pricing of castings, and to quality control of product.

In our industrial civilization, castings have become basic materials of construction because pouring molten metal represents the best and the least expensive method of producing metallic shapes. Rising costs of materials and labor of necessity have been reflected in the selling price of castings. Since it is possible that at some point these increasing costs may eliminate one of the important advantages of castings, foundrymen should make every effort to reduce waste and improve production efficiency as a means of cost control.

The problem of quality control is even more important. Castings must fulfill the purpose for which they were designed, and quality must be constant from shipment to shipment, if customers are to be satisfied and the advantages of cast parts maintained. Success in quality control demands good supervisors, application of the vast storehouse of foundry knowledge now available from many sources, and the development of new and better production methods.

Frank G. Steinebach

Editor

THE FOUNDRY—WHEREVER METALS ARE CAST

By A. W. GREGG
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Foundry Equipment Department
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Harvey, Ill.

Mechanization for the Small Foundry

BOTH large and small foundries are seriously considering the subject of plant mechanization. Large production foundries, with their huge tonnages and long-run jobs, can well afford to mechanize all possible operations, but the situation is entirely different for the smaller foundries, and especially for those doing jobbing work. Obviously, the latter cannot afford to install the elaborate and complete equipment which the big fellows consider not only essential but a good money-making investment.

On the other hand, the small foundries find it necessary to mechanize to some extent if they are to be in a position to compete with others, and the competitive situation is very likely to become critical in the not too distant future.

Years ago, when the hourly rate for labor ranged from 17 to 20 cents per hour, and good molders could be hired for about 35 cents per hour, the subject of mechanization was not of such paramount importance. Today, with common labor rates of $1 or more per hour in most localities, operations which can be accomplished mechanically instead of manually are subject to investigation.

Foundries handle 150 to 200 tons of material for every ton of castings shipped, and the operation of a foundry today presents a real engineering problem in the economical handling of those materials.

Forty years ago the equipment required for the operation of a small gray iron foundry was very simple indeed. The following is about all that was essential: A cupola with an elevator to hoist melting stock and fuel to the charging floor, a few ladles, a crane if the work was heavy enough to justify it, some wood flasks, a core oven (usually home-made), a scale, a couple of grinders and a tumbling barrel or two. Of course, some miscellaneous small tools were needed, such as rammers, shovels, brushes, chisels and a couple of wheelbarrows.

A man could get started in the iron foundry business, in a small way, with an outlay of $10,000 to $12,000 for equipment. We know of some shops started for less. No one today would consider operating even a 5-ton per day foundry with only the equipment used in the small foundry of 30 to 40 years ago.

The term "small foundry" is a very elastic one, so for the purpose of this discussion we shall consider that the small foundry is one producing 5 to 25 tons of good castings per day, or from 125 to 500 tons of castings per month. The 500-ton per month shop is, of course, a fairly good size foundry.

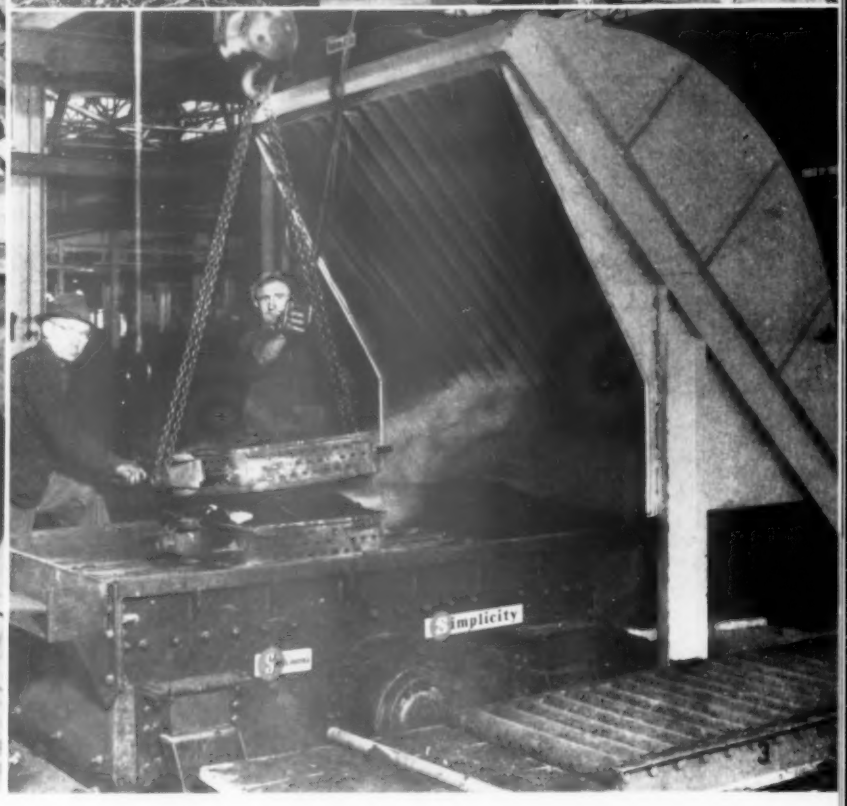
Fig. 1—Special monorail bucket loader equipped with scale shown being loaded in material yard

Fig. 2—Material yard provided with two 7½-ton cranes, coke and stone hopper and iron loading platform

Fig. 3—Side hood draws off dust and gases from shakeout operation

Benefits of Mechanization—The benefits which foundries expect to gain by mechanization are: 1. Reduced operating costs. 2. Increased output. 3. Improved quality. 4. Reduction of scrap losses. 5. Improved working conditions. 6. Ability to attract a better class of labor. 7. Safer working conditions.

Every item listed is of great importance, and not the least important is the improvement of working conditions, making it possible to attract a better class of labor. Men will no longer work in the kind of shop in which many of us went to work years ago. Mechanized shops have radically improved working and sanitary conditions, and the back-breaking work, nec-



essary to produce castings in the old-time foundry, has been largely eliminated.

If foundries are to maintain their rightful place in our industrial organization, they must be made a better place in which to work. In order to obtain the right kind of personnel it is absolutely essential that they provide cleaner and more attractive working conditions than in the past.

Foundries must be concerned not only with the men in the shop—the molders, the coremakers, and other operatives—but also must attract the class of men upon whom they must depend for future supervisors, managers and executives. It is notorious that foundries for years have failed to attract the engineers and other technical men turned out by our fine technical schools and universities.

A questionnaire was submitted recently to the senior class at a large midwestern technological institute in order to obtain the ideas of these young engineers and metallurgists concerning the industry and what opportunities it has to offer them. In reply 94 per cent of the class said that "under no circumstances would they consider the foundry industry as a life career." Their prime objection was to the poor and dirty working conditions.

The foundry industry has failed to do a good job of selling the engineering graduate on the splendid opportunities it has to offer, and steps are now being taken to remedy this situation. Probably the young men answering the questionnaire had only very vague and incorrect information concerning the foundry business.

Many operators of small foundries believe that mechanization is something for the big foundries, such

Mechanization

as those operated by the automotive industry and the manufacturers of agricultural machinery. They feel that the small foundry, and especially the small jobbing foundry, cannot justify the expense of machinery and rigging because of small tonnage and lack of long-run jobs. Each foundry must, of course, decide how far it will pay to mechanize, based on its individual conditions as to capital investment, class of work, volume of work, tonnage, repeat orders, etc.

It is very possible to over-mechanize and no equipment should be purchased which cannot be kept in reasonably continuous and regular operation. Idle equipment collects depreciation charges which can be a heavy burden on the cost to operate any shop.

Sand Preparation Equipment—When a foundry decides to install mechanized equipment, in many cases the first subject to be considered is sand handling and

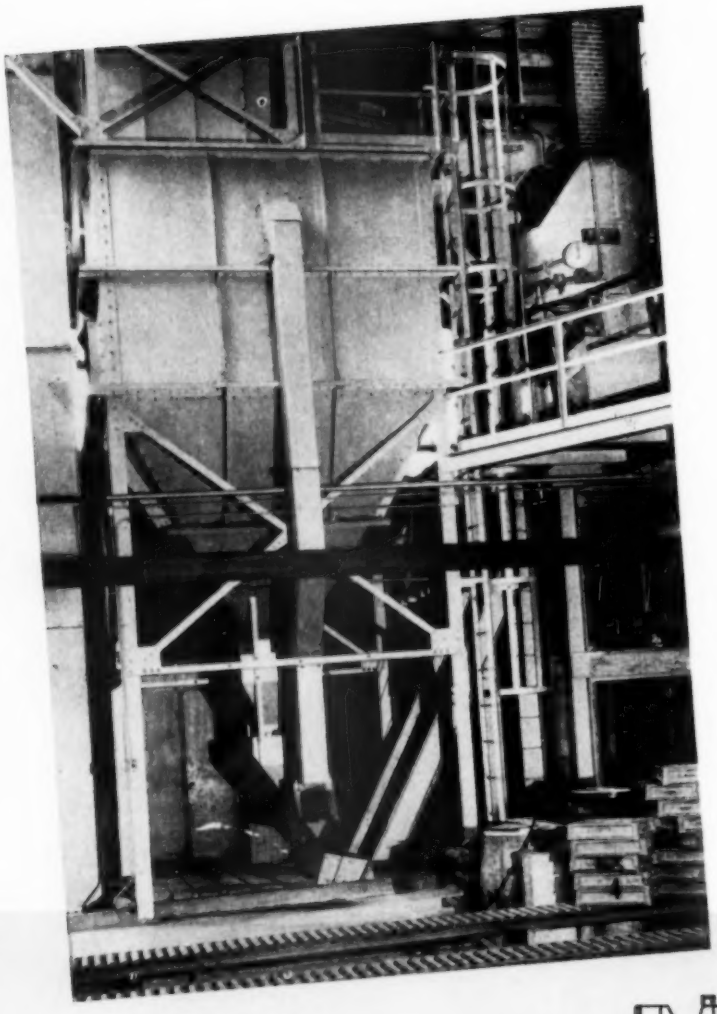


Fig. 4—Sand preparation plant. Elevator at left delivers shakeout sand to revolving screen on top of storage bin. Screened sand is measured automatically from bin into bucket of skip loader, then carried up to mixer located on platform at right

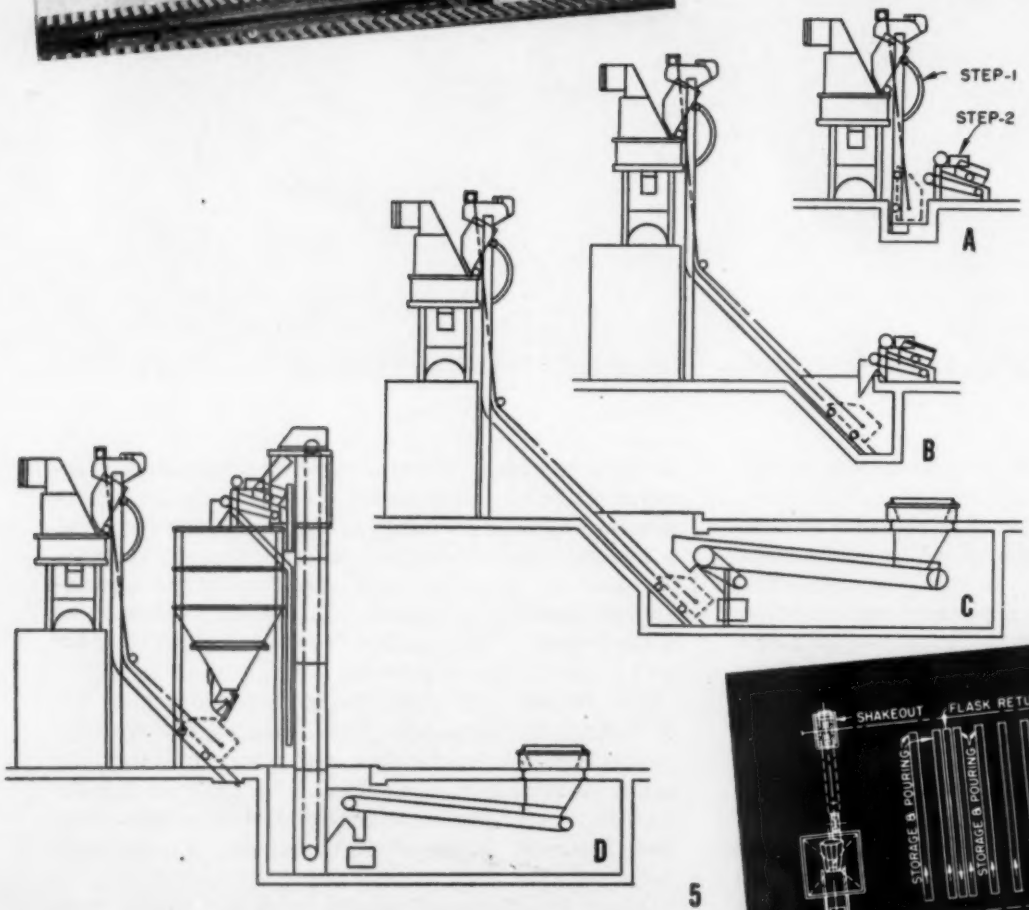
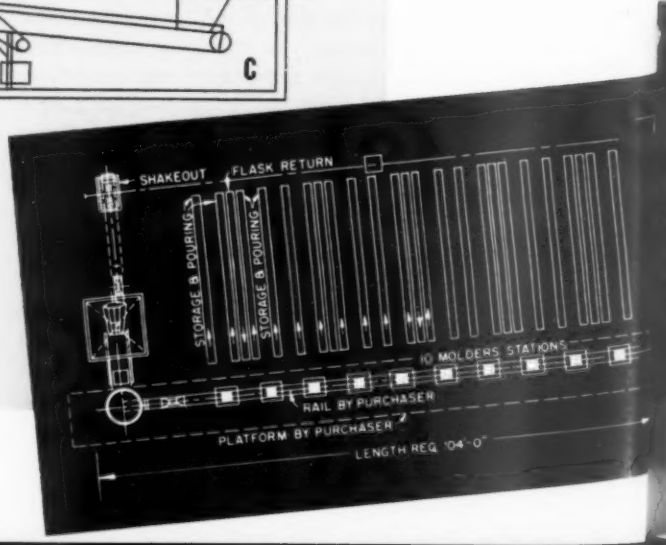


Fig. 5 — Progressive steps in which complete sand handling system can be installed. Each step provides a workable unit, and there is no interference with succeeding steps



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sand preparation. Some 5 to 10 tons of sand must be handled for every ton of castings produced, and even the small foundry can no longer afford to cut and temper sand by hand. This operation can be performed more cheaply and far better by mechanical means. There are many types of machinery for the preparation of facing and heap sand, all of which find useful applications depending upon the type of work and the practice of the foundry.

Steel foundries were the first to adopt the muller type of sand mixer, but it has now been quite universally adopted by the iron foundries. In some applications it is used only for facing and core sands, but in many iron foundries, especially those using synthetic sand rather than that with natural bond, all sand, both facing and backing, is put through the muller-type mixer.

Development and installation of a complete sand preparation and distributing system for a ten molding machine unit can be accomplished in easy steps and the expense can be spread over several years. When completely installed, the system will include muller, loader, distributing system, sand hoppers over molding machines, shakeout equipment, magnetic pulley with belt and storage hoppers. The complete sand system will cost perhaps $35,000 to $45,000, not including foundations and installation cost. Roller conveyors to transport molds from the molding machines to the shakeout will cost $8 to $10 per foot. We believe roller conveyors provide a cheap method of moving molds and relieve the molder of carrying them from the machine to the pouring station.

The advantages of such a system are too obvious to require much comment. There is no sand on the floor, and properly prepared molding sand is delivered to the molder by gravity from overhead storage hoppers. Better and cleaner castings are produced which results in lower cleaning costs and reduced rejects.

The steps by which a complete system can be installed are illustrated in Fig. 5. Each step provides a workable unit, and there is no interference with succeeding steps. The cost, not including foundations and installation, is approximately as follows:

	Cost	Total
Step 1 (Fig. 5A)	$8,000	$8,000
Step 2 (Fig. 5A)	2,500	10,500
Step 3 (Fig. 5B)	700	11,200
Step 4 (Fig. 5C)	3,500	14,700
Step 5 (Fig. 5D)	10,800	25,500
Step 6 (Fig. 5E)	13,000	38,500
Step 7 (Fig. 5F)	10,000	48,500

Molding Machines—In connection with the sand handling system, when completed for a ten-molder unit as described here, the following molding machines have been suggested by a well known manufacturer of this equipment. These are typical for a ten-molder unit for a jobbing shop making small and medium weight iron castings.

	Flask Size (up to)	Cost per Machine	Total Cost
6 Jolt squeezer machines	14″x20″	$500	$3,000
2 Jolt pin lift (paired cope & drag)	16″x24″	1,000	2,000
1 Jolt roll-over (for drags)	24″x40″	1,500	1,500
1 Jolt pin lift (for copes)		1,000	1,000
Cost of 10 machines			$7,500

Very conservatively these machines, if installed with overhead sand hoppers and roller conveyors, should produce molds in 8 hours approximately as follows:

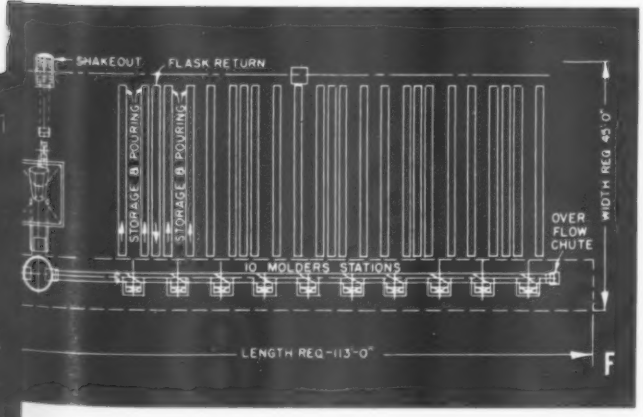
	No. Molds
6 Men on jolt squeezers (320 molds per man per day)	1920
2 Men on pin lift pair (40 molds per hr × 8)	320
2 Men on jolt roll-over pin lift pair (30 molds per hr × 8)	240
Total in 8 hours	2480

The weight of castings produced will, of course, depend entirely on the class of work, but assuming the foundry has a range of castings weighing from 2 to 30 lb, the daily production should be 10 to 15 tons from these ten machines.

A complete ten-unit sand preparation and distributing system, together with proper molding machines and roller conveyors, will represent an investment at today's figures about as follows:

10 Molding machines	$7,500.00
900 ft of roller conveyors	9,000.00
Sand system	40,000.00
Installation and foundations	20,000.00
	76,500.00
10% for unforeseen expense	7,650.00
Total	$84,150.00

On a 20-year basis, the annual depreciation is $4200, or about $16 per day. This is about the daily wage for one molder; but such an installation should multiply several times the output of ten molders



Mechanization

making molds by hand, shoveling and tempering sand, and carrying molds from bench to pouring location.

The all-around mechanic is rapidly becoming a thing of the past, and machine molding is essential today. A semi-skilled man with the proper molding machine and good rigging will make six to ten times as many molds and much better castings than was ever possible with hand methods. The molder should do nothing but make molds and should never have to wait for anything—sand, cores, flasks, etc.

Metal Department—The metal handling and melting operation starts in the stock yard when cars of raw material are delivered. The cost to unload scrap, pig iron, sand, limestone, coke, etc., is far less with a crane equipped with magnet and grab-bucket, than if accomplished manually. The tonnage of material handled will determine if the investment in a stock-yard crane can be justified.

The cost of a 5-ton, 50-ft span yard crane with enclosed cab, plus a 1-yard grab-bucket, 39-in. magnet and motor-generator set is about $22,000.

A somewhat heavier installation, say a 7½-ton capacity, 60-ft span crane with a 45-in. magnet and a 1½-yard grab-bucket will cost about $5000 more. In either case a runway, perhaps 100 ft long, will be required which will cost about $100 per foot, or $10,000. Total cost for crane and accessories, plus a 100-ft runway, will therefore be from $32,000 to $37,000.

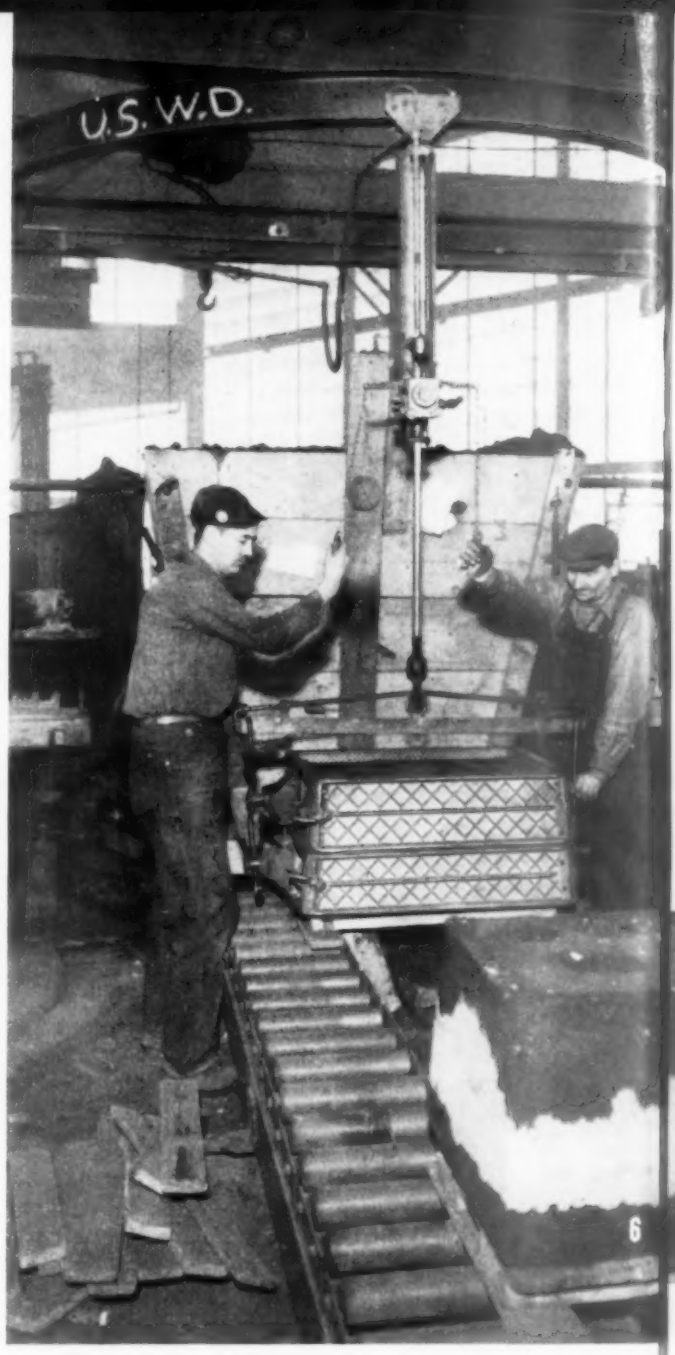
The operating cost for either crane will be about $3.20 per hour, based on the following figures: Power at 1c per kwh or about $800 per year; $3000 per year for the crane operator; $1850 per year allowed for depreciation; $1000 per year for maintenance, and assuming 8 hours per day operating time.

Some interesting comparisons of the labor cost to unload coke, pig iron and scrap by hand and by a crane equipped with magnet and grab-bucket, were obtained from a large Milwaukee manufacturer.

Unloading 30-ton Car of Coke—By hand three men required 8 hours at $1.06 per hour or $25.44 per car. Labor cost per ton was 85 cents. With crane and grab-bucket one craneman at $1.25 per hour and one hitcher at $1.15 per hour required 1½ hours. Labor cost per car was $3.60 and per ton was 12 cents. Estimated increase of 8 cents per ton to cover power, maintenance and depreciation brought total cost to 20 cents.

Unloading 50-ton Car of Pig Iron—By hand four men required 8 hours at $1.06 per hour or $33.92 per car. Labor cost per ton was 68 cents. With crane and magnet one crane man at $1.25 per hour and one hitcher at $1.15 per hour required 1½ hours. Labor cost per car was $3.60 and per ton was 7 cents. Allowance of 5 cents per ton for power, maintenance and depreciation brought total cost to 12 cents.

Unloading 35-ton Car of Scrap—By hand three men required 8 hours at $1.06 per hour or $25.44 per car. Labor cost per ton was 73 cents. With crane and magnet one crane man at $1.25 per hour required one hour. Labor cost per car was $1.25 and per ton was 3.5 cents. Adding 5 cents per ton for estimated power, maintenance and depreciation brought total cost to 8.5 cents.



The savings in unloading costs per ton made possible with a yard crane, as illustrated in this case, are 65 cents for coke, 56 cents for pig iron and 64.5 cents for scrap—say an average saving per ton of materials handled of 62 cents.

Based on this saving and an investment of $37,000 for crane and runway, and considering only the savings in unloading materials for the cupola charge, the accompanying table shows what period of time is needed to recover the investment for foundries having the capacities shown.

Each foundry should decide, based on its tonnage, if savings in unloading material, or any other considerations, justify the installation of a yard crane.

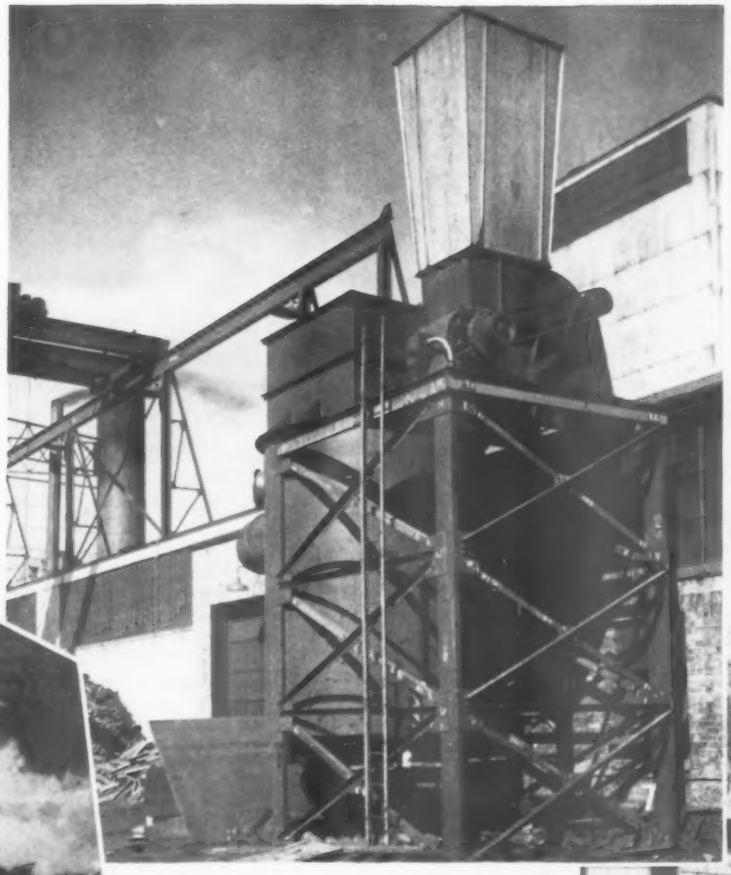


Fig. 6—Operating a jolt squeeze pin lift molding machine

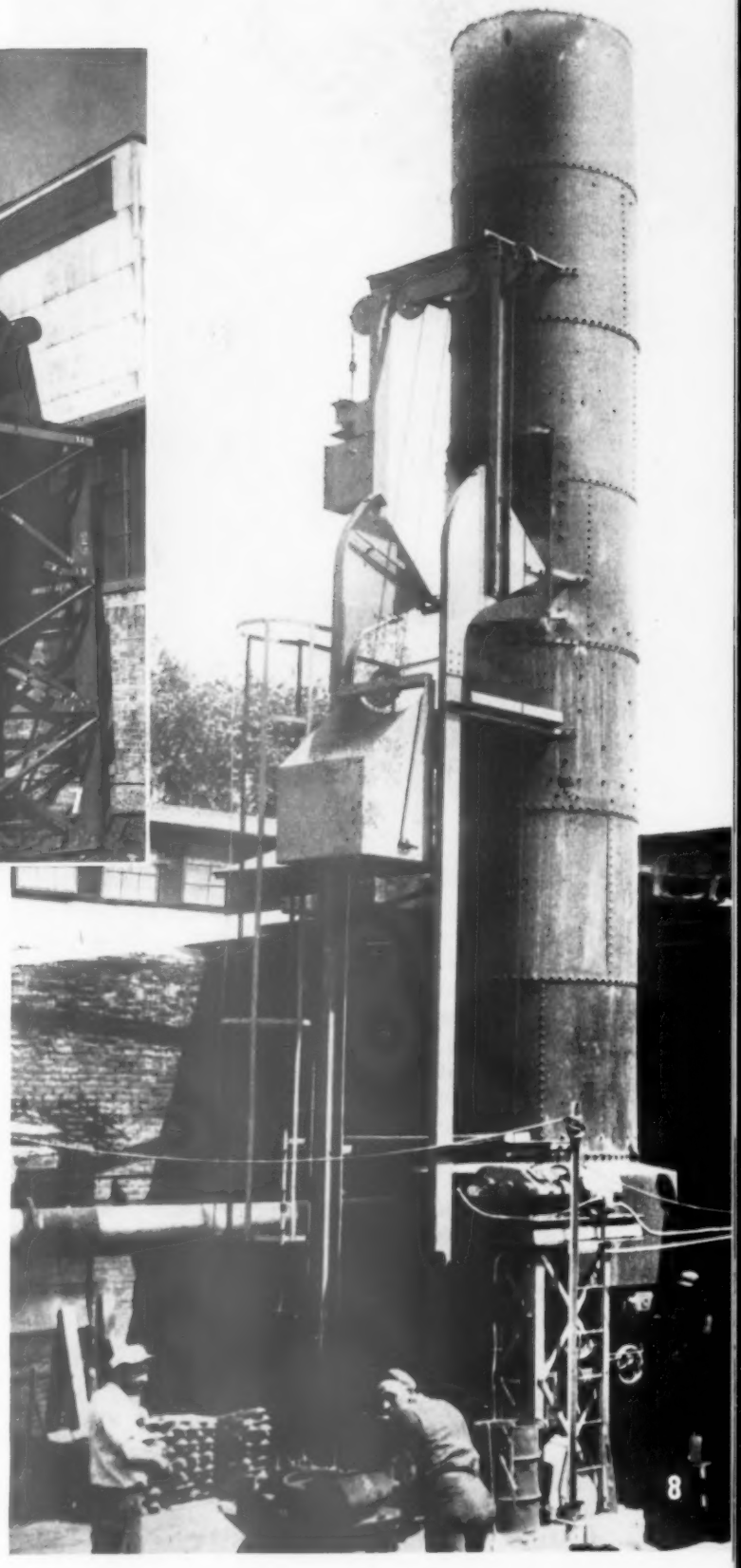


Fig. 7—Unit for handling dust emanating from shakeout and sand preparation system

Fig. 8—Vertical skip hoist used in cupola charging

Where large tonnages are involved, additional savings in the cost of making up charges with the magnet crane should be taken into account.

Mechanical Charging Equipment—Charging a cupola by hand is a disagreeable job, winter and summer, and one for which (*Please turn to page* 142)

Years To Recover Investment in Yard Crane

Daily Casting Capacity, Tons	Daily Melt, Tons	Annual Melt Plus Fuel	Annual Saving	Years (Approx.) Investment Recovered
5	8	2,080	$1,289.60	29
10	16	4,160	2,579.20	14
15	24	6,240	3,868.80	9½
20	32	8,320	5,158.40	7
25	40	10,400	6,448.00	5¾

A SUBSTITUTE FUEL FOR CUPOLA USE

By W. J. REAGAN
Associate Professor of Metallurgy
and
C. C. WRIGHT
Head, Department of Fuel Technology
Pennsylvania State College
State College, Pa.

Fig. 1 (left)—Pouring fluidity test mold

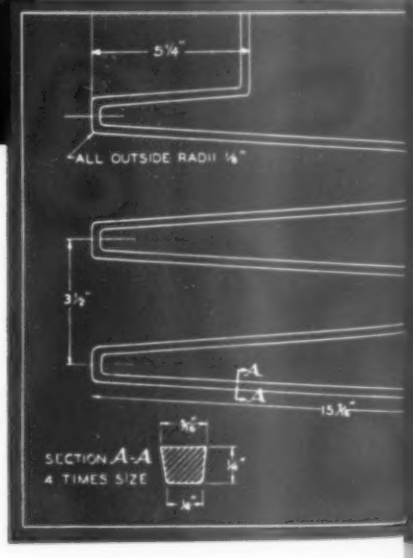


Fig. 2 (right)—Sketch showing mold for testing design of iron fluidity

CONSIDERABLE work has been done in the past on the use of anthracite coal as fuel in cupola operation. Years ago anthracite was used entirely with quite satisfactory results. Due to the present difficulty of obtaining a sufficient quantity and at the same time a proper quality of foundry coke, anthracite has again appeared as a possible substitute for coke in the cupola.

During the past year we have been co-operating in a study involving the use of anthracite in a commercial cupola operation. In this operation considerable tonnages of anthracite coal have been regularly used and the data contained in this brief resume will describe these operations.

The plant (Elmira Works, Apparatus Division, General Electric Co.) in which this study was made has several cupolas, and anthracite has been used in all of them in varying quantities over the past year. When permission was given to study this operation we were allowed to select one of the units in which to do our work. A molding unit employing metal molds for casting production was selected, the reasons for this selection being as follows:

1. This cupola operates continuously, from 7 a.m. until 2:30 p.m.—five days each week.

2. The chemical analyses of the iron produced does not vary greatly from day to day so that elimination of this usually changing factor in a study of this type is important. The approximate analyses of the iron produced by this unit was as follows: C 3.60 per cent, Mn 0.90 per cent, Si 2.40 per cent, P 0.20 per cent, and C 0.07 per cent.

3. As a result of producing iron of constant

analyses the cupola charge did not vary greatly, and thus a second important variable was eliminated. A typical charge was as follows: Total metal weight 260 lb, total fuel weight 40 lb, limestone weight 12 lb, limestone per cent 4.6, pig iron in charge 60 per cent, cast iron scrap in charge 40 per cent.

It was usual to maintain the weight of the fuel constant, and the metal weight was increased or decreased to obtain any desired fuel ratio; for example, with a 9/1 ratio, the fuel weight would be 40 lb and the total metal charge would be 360 lb.

4. All castings in this unit were cast into metal molds, eliminating the problem of sand variability. These metal molds were maintained at a relatively uniform temperature, were coated with soot each time they were used and in general provided an ideal receptacle for the molten metal that eliminated many of the usual foundry problems.

During some 12-months' operation with anthracite in varying proportions in the charge, the saving in fuel costs has been substantial, with no reduction in metal quality or quantity.

It should be kept in mind that at this particular location the delivered cost of coke is about $22 per net ton while anthracite costs about $15 per net ton, a quite substantial differential.

The cupola in the permanent mold unit has a 51-in. diam. shell. At one period of the operation it was lined down to 24-in. ID and at another period it was lined to 30-in. ID. It might be well to note that when this cupola was lined down to 24-in. ID, this diameter was maintained to a point about 24 in. above the top of the top row auxiliary tuyeres. Above this point the diameter was about 35 in. Operations during both of the periods mentioned will be discussed in some detail.

This cupola is of the balanced blast type (the blast is not preheated) and the tuyeres consist of three rows of four tuyeres each. The main (or lower) tuyeres are 4 in. in diam and the two rows of auxiliary tuyeres are 2 in. in diam. Center line of main tuyeres is 14¾ in. above sand bottom. Center line of main tuyeres to center line of first row of auxiliary tuyeres is 16½ in. Center line of first row of auxiliary tuyeres to center line of second row of auxiliary tuyeres is 18 in. Distance from sand bottom to top of top row of auxiliary tuyeres is 49 in.

The blower is of the centrifugal type and volume is maintained by a G. E. wattmeter type air weight control. Maximum wind volume is 125 lb and maximum pressure is 20 oz.

In this particular unit the tonnage required determines the number of machines operated. The unit contains four machines, each machine making about 100 revolutions per day and 12 cast iron molds are mounted on each machine. The molds may contain from one to eighteen castings and normal production from one machine is from 2400 to 4800 castings per day. (In some cases as high as 15,000 castings may be produced).

During our studies at this plant, two periods of operation were involved, one with two machine operation and the other with three machine operation. In terms of tons per hour and tons per day, cupola size, etc., these operations were as follows: Two machine operation, ID of cupola 24 in.—Net tons per hour 2.2-2.5, net tons per day (7½ hours) 16.5-18.5. Three-machine operation, ID of cupola 30 in.—Net tons per hour 3.75-4.00, net tons per day 28.00-30.00.

In a study of this type two factors invariably enter into the problem. One is metal temperature and the other is metal fluidity. As both of these items often are quoted inaccurately we thought it would be wise to obtain information as accurate as possible regarding both, and that it would be best to set up some standard of measurement for both that would give a satisfactory answer at this plant and probably in others. Temperatures were normally taken by means of an optical pyrometer.

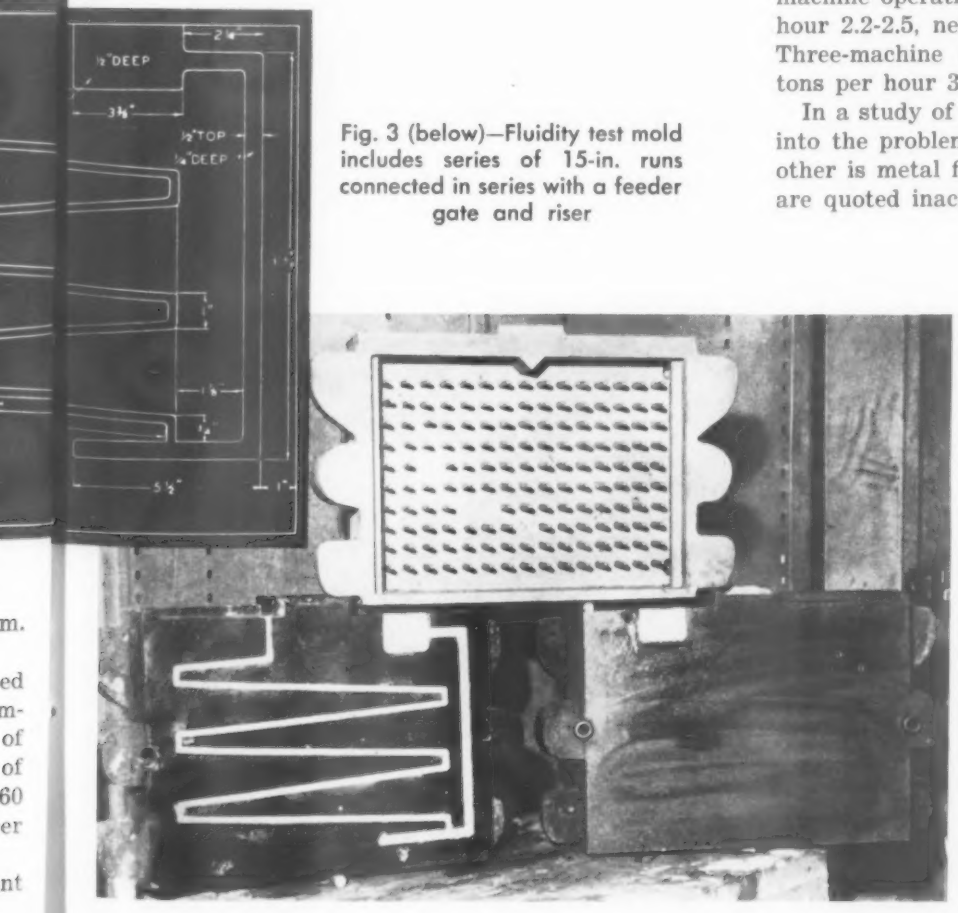
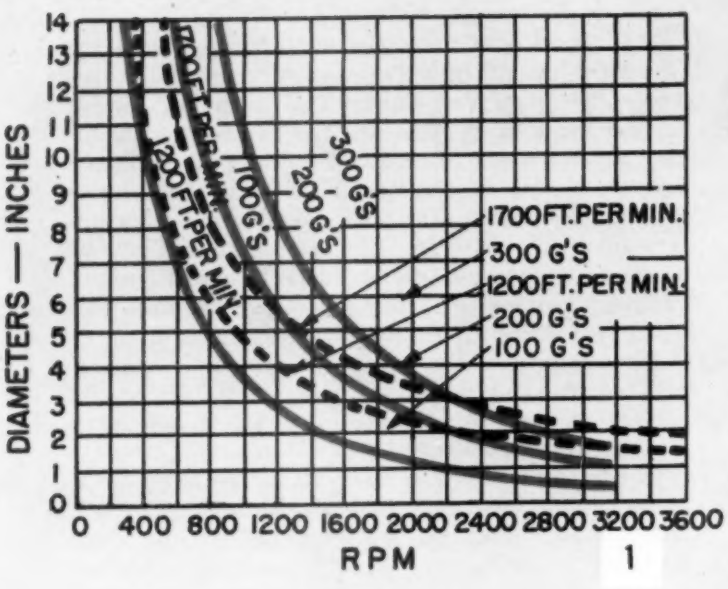


Fig. 3 (below)—Fluidity test mold includes series of 15-in. runs connected in series with a feeder gate and riser

Temperature Measurement—For the determination of temperature we used a Pt, Pt-Rh thermocouple of a design particularly suited for this installation. Corrections were made for temperature variations at the cold junction and a potentiometer was used to measure the E.M.F. generated by the couples. The thermocouple wires were enclosed in two fused silica protection tubes. The outer tube was about ⅜-in. OD and the inner tube about 3/16-in. OD. The couple was im- (*Please turn to page* 138)

Centrifugal



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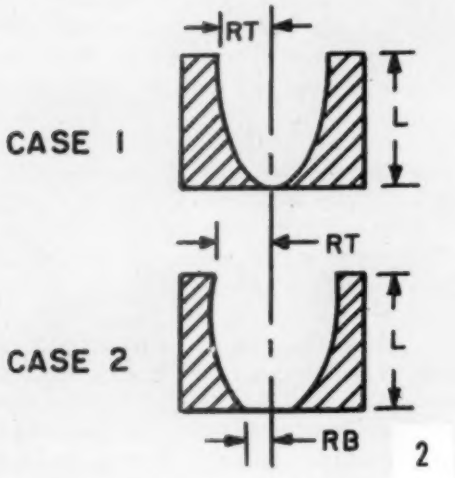

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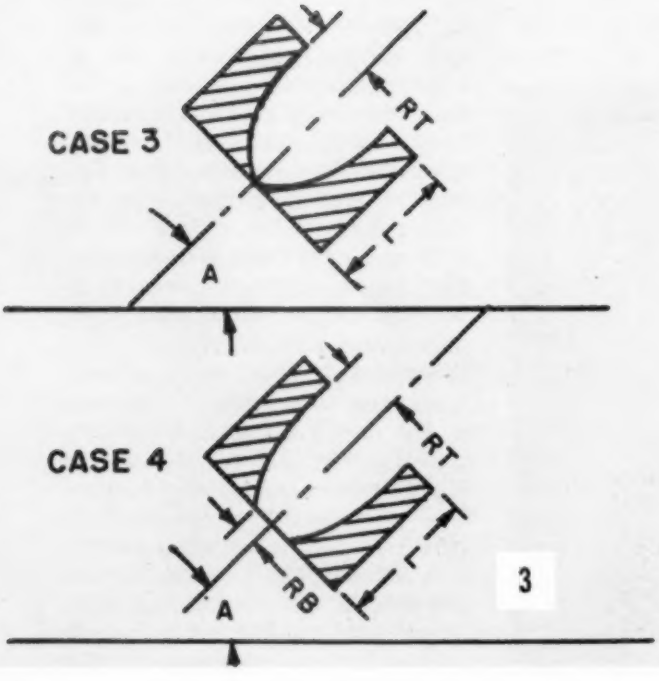

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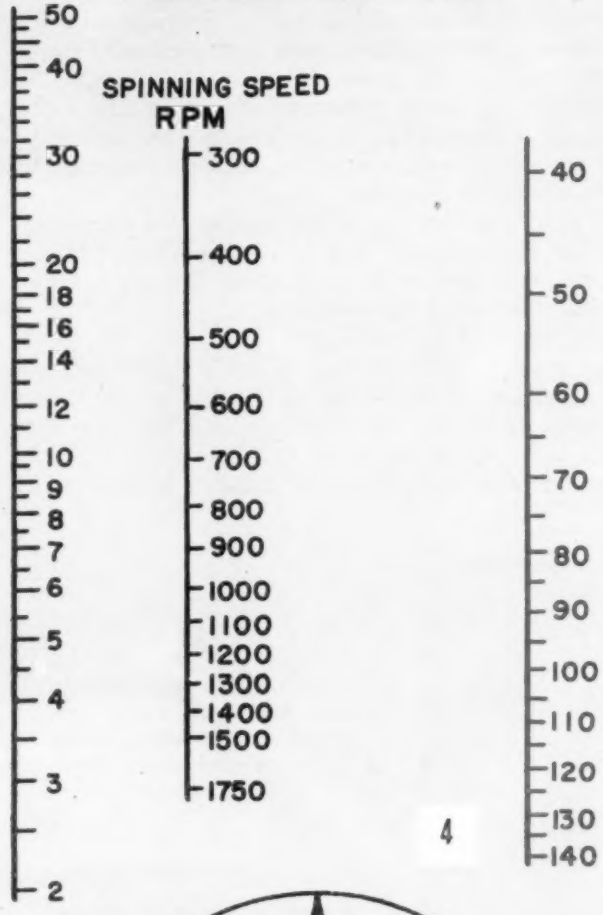
DIAMETER — RPM — FORCE



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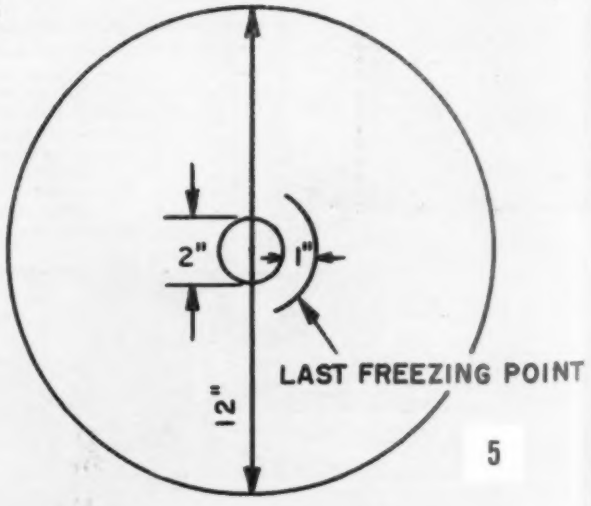


5

Casting of Steel

This is the first of three articles discussing the various factors involved in production of steel castings by the use of centrifugal force. In this installment the author describes the true centrifugal method

By JOHN HOWE HALL
Consultant
Swarthmore, Pa.

THREE methods of utilizing centrifugal force in the pouring of steel castings are known respectively as true centrifugal casting, semi-centrifugal casting, and centrifuging. In the first-named, liquid steel is poured into a cylindrical mold revolving so fast that the metal is held by centrifugal force against the inside of the mold, and solidifies into a tube, without the use of any central core. The mold may be spun on a vertical or a horizontal axis, or inclined at an angle to the horizontal. Semi-centrifugal casting process is used to make wheels, gear blanks and similarly shaped pieces in a complete mold, revolved on a vertical axis. The metal is poured in through the hub, and carried to the outside of the mold by gravity and by centrifugal force. In centrifuging, a mold with a central down-gate is revolved about a vertical axis, the metal being carried through radial sprues to a number of mold cavities symmetrically grouped about the down-gate. Depending upon their size and shape, the castings in the semi-centrifugal and centrifuging methods may be all at one level, or at a number of levels in the mold.

Not all American authors have used these three terms as here defined, "Centrifuging" having been rather loosely used to describe semi-centrifugal pouring, especially in the cases where the mold is filled while stationary, and then revolved. To the author, however, the terminology given previously, and followed by several other authors, appears to be the most logical so far proposed.

In true centrifugal casting, very high rotating speeds are used and centrifugal force is practically the only means of feeding the metal to the places where it is wanted. Gravity in fact slightly reduces its effectiveness. In the other two methods, there are usually joints in the molds, so that they must be revolved at relatively lower rates. The centrifugal effect, therefore, is very much smaller, and gravity plays a considerable part in filling the molds. None of the methods is new, as the principle has been known and used for many years, and true centrifugal casting long ago almost completely replaced the older methods in the manufacture of the cast iron pipes, which were formerly poured in stationary vertical molds with central cores. In the last eight or ten years, however, all three methods have been widely employed and much interest in them has been aroused by claims, frequently greatly exaggerated, of their superlative merits.

Equipment required to produce castings by the true centrifugal method is expensive, so that in order to keep down the unit cost of the castings, a very high rate of production must be maintained. The process, therefore, is used chiefly when a great number of castings of a given size and shape are to be made. In using this method, short cylinders may be produced with the mold revolved (*Please turn to page* 176)

Fig. 1—Centrifugal casting speed curves according to Zuehlke

Fig. 2—Mold spinning on vertical axis

Fig. 3—Mold spinning on axis at angle to vertical

Fig. 4—Nomogram for calculating spinning speed to constant centrifugal force (Donoho)

Fig. 5—Determination of pressure at point where last metal freezes

Precision Investment

AT ALLIS-CHALMERS

DURING World War II, Allis-Chalmers Mfg. Co., Milwaukee, entered the precision casting field in connection with its production of aircraft turbo-superchargers. When the company's supercharger plant was built, the accepted method for producing the turbine buckets was forging. But the requirements for greater horsepower and efficiency of military aircraft was causing a trend toward higher and higher supercharger operating temperatures, which eventually forced a change in bucket materials to complex heat-resisting alloys which were virtually unmachineable and could not be forged. This change, in turn, caused supercharger manufacturers to resort to development of industrial precision casting as the only practical method of mass-producing buckets from these alloys.

In 1943, Allis-Chalmers installed precision casting equipment capable of producing 600,000 supercharger buckets a month at its plant, and during the rest of the war, literally millions of blades were cast. To speed getting into production, equipment for this plant was patterned after that already in use elsewhere. However, development work to improve the process and equipment began almost immediately, and in 1944 the company set up a pilot plant at its West Allis Works to do research and development on precision casting in connection with other war contracts.

Shortly before the termination of the war, the company undertook a survey to determine the extent to which the experience and theoretical knowledge obtained from its wartime precision casting operations could benefit Allis-Chalmers products. As a result of this survey, the company decided to continue its precision casting development and manufacturing. A new foundry was laid out at the West Allis works

Fig. 1—Removing completed patterns from automatic wax injection machine developed by the company

Fig. 2—Joining individual patterns to specially designed sprue structure with heated tools

Fig. 3—Assembly of flask and pattern group. Pattern is attached to bottom plate with wax. Flask is alloy steel lined with waterproof paper

Fig. 4—Filling flask with investment mixture. Flask is vibrated to pack investment around pattern

Fig. 5—Wax injection machine. Dies are clamped in pneumatic press controlled by a foot pedal and wax is pumped under high pressure

Fig. 6—Casting after removal from flask but before individual pieces have been cut from sprue

Casting

Fig. 7—Gas-fired pusher furnace in which molds are de-waxed and heated to 1850° F prior to pouring

Fig. 8—Induction furnace for melting the charge

Fig. 9—Knocking casting out of flask with air hammer

and went into full scale operation within the past year.

Precision investment casting at Allis-Chalmers is done by the familiar lost wax process. Patterns of the desired part are produced by the injection of wax into metal dies. The patterns thus formed are assembled on wax sprues, and a refractory material is poured around them and allowed to harden. Melting the wax out from the block of hardened investment leaves a cavity into which metal is poured to form the casting. After the casting is cleaned, the individual parts are cut free from it and smoothed over at the gate by grinding.

As carried out in this foundry, the process is unusually simple and free from unnecessary operations and complicated equipment. Instead, standard foundry technique is used wherever possible. Where machines speed production and lower cost, as in pattern production, they have been highly developed; but where they needlessly complicate the process, as in pressure or centrifugal casting of metal, they have been eliminated.

At present, the plant can pour about 100 pounds of metal an hour, with room for expansion to approximately triple this figure.

The plant normally does not make the metal patterns or dies which it uses, but it has a completely equipped machine shop for reworking and maintaining dies and where development and experimental dies are made. Although steel dies are now used wherever practicable, the shop is equipped to make cast metal dies if desired.

After considerable experiment, Allis-Chalmers has standardized on wax as a pattern material, finding it preferable over present plastics from the standpoint of lower injection pressures and better shrinkage control. Wax is compounded and melted for all machines at a central point just outside the wax pattern room. Also at this station, reclaimed wax is molded into sprue shapes.

Wax injection apparatus is of three types. Several of the gun-type injectors used at the supercharger plant are still in use for short runs and development work. These resemble grease guns, being filled by hand from a container of softened wax, and then placed in a jig where the nozzle of the gun fits into the die. A pneumatic ram bears against the gun handle to provide injection pressure.

A second type of machine (Fig. 5), developed at this foundry, has a central wax storage container from which wax is pumped under pressure to the injection nozzle through flexible hoses. The machine's storage tank, pump, and hoses are surrounded by water jackets in which the water is circulated at a thermostatically controlled temperature which insures a constant supply of wax at the correct injection temperature at the injection nozzle. By bringing the wax to the die through the hose, rather than requiring the die to be mounted in the machine, this injector places no restrictions on die size, position or mounting. Dies are usually held in a pneumatic clamp operated by a foot pedal. Connection between the injection nozzle and the die is made through Zerk fittings.

For mass-production work a third machine has been designed by Allis-Chalmers engineers. This machine (Fig. 1) is almost completely automatic in its operation. After the operator pushes a button to start the cycle, the closing of the dies, injection, time delay for wax cooling, refilling of the wax gun, and opening of the dies, all take place automatically.

The machine is equipped with an air cylinder which can be attached to appropriately designed dies for core pulling. This cylinder does not operate as a part of the automatic cycle, since normally the horizontal cores serve to lift the completed patterns from the lower half as the dies separate, and to hold the pattern until the operator is ready to remove it. A separate pushbutton is provided to actuate the core puller as the operator re- (*Please turn to page* 248)

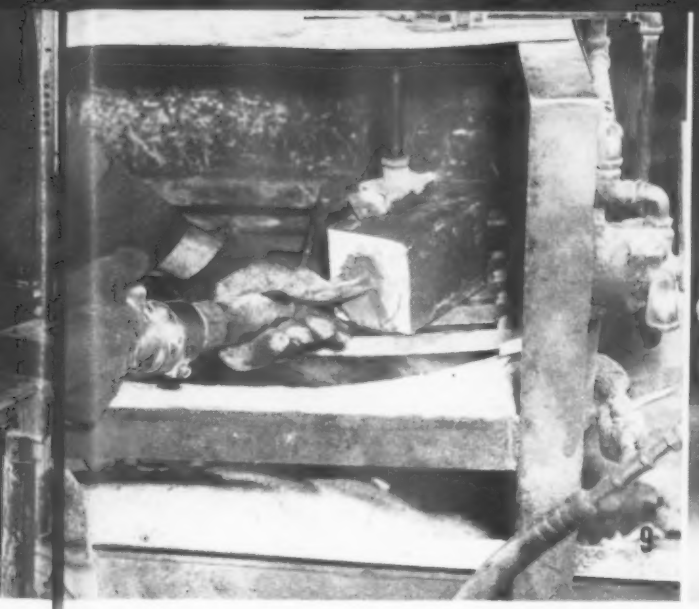


Fig. 10—Department for casting cutting and cleaning

Fig. 11—Final inspection. Castings on table are typical of wide variety of parts being precision cast

Fig. 12—One furnace charge will fill up to five molds

Annual Meeting Held by Malleable Founders

By FRANK G. STEINEBACH
Editor
THE FOUNDRY

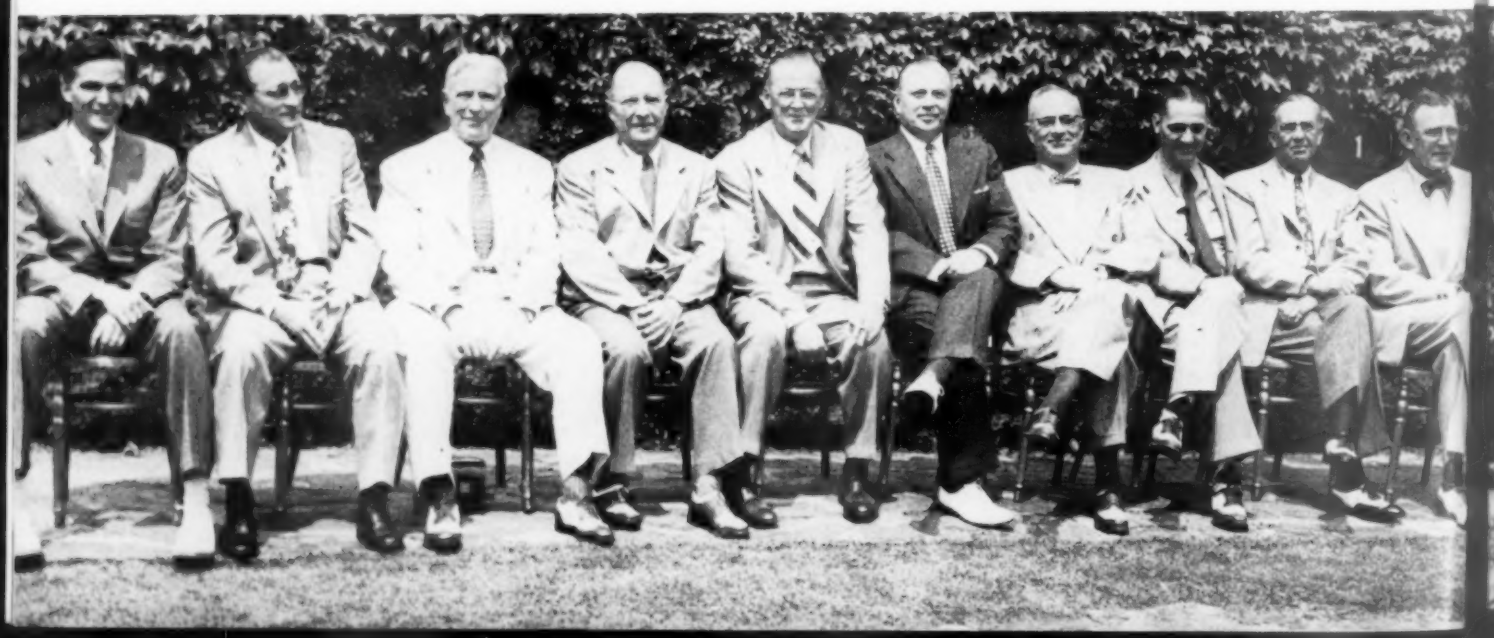
ANNUAL meeting of the Malleable Founders' Society was held at the Homestead, Hot Springs, Va., June 10-11, with the largest and most representative attendance in the history of the organization. The two-day meeting was devoted to the reports of standing committees of the society, and to the discussion of important problems facing the industry.

Collins L. Carter, president and general manager, Albion Malleable Iron Co., Albion, Michigan was elected president, and James H. Smith, general manager, Central Foundry Division, General Motors Corp., Saginaw, Mich. was elected vice president. The following new directors were elected: John T. Llewellyn, II, president, Chicago Malleable Castings Co., Chicago; John A. Wagner, president, Wagner Malleable Iron Co., Decatur, Ill.; Frank O. Parker, vice president, Dayton Malleable Iron Co., Dayton, O.; and H. Nelson Albright, manager, Columbia Malleable Castings Corp., Columbia, Pa.

One of the outstanding features of the entire program was the presentation of the Charles H. McCrea award medal for 1948 to Robert R. Fauntleroy, president, Moline Malleable Iron Co., St. Charles, Ill. for distinguished service to the malleable iron industry over many years. The presentation was made by Brinton Welser, vice president, Chain Belt Co., Milwaukee, and Wilson H. Moriarty, vice president in charge of sales, National Malleable & Steel Castings Co., Cleveland, and retiring president of the society.

Mr. Welser stated that Bob Fauntleroy started his business life in 1899 and, while not a producer of malleable iron at that time, was intimately connected with its use. He entered the field of malleable production in 1905 and has served as president of his company since 1921. Mr. Fauntleroy has maintained continuous affiliations with the industry for over 40 years. With but one exception no other living member has an equally long record of working in its interest. Mr. Welser stressed that Mr. Fauntleroy has made continuous and substantial contributions to-

Fig. 1—Board of directors of the Malleable Founders' Society, left to right: J. T. Llewellyn, Chicago Malleable Castings Co., Chicago; J. A. Wagner, Wagner Malleable Iron Co., Decatur, Ill.; W. H. Moriarty, National Malleable & Steel Castings Co., Cleveland; F. D. Brisse, Laconia Malleable Iron Co., Laconia, N. H.; J. H. Smith, Central Foundry Division, General Motors Corp., Saginaw, Mich., society vice president; C. L. Carter, Albion Malleable Iron Co., Albion, Mich., society president; H. M. Laws, New Haven Malleable Iron Co., New Haven, Conn.; C. A. Gutenkunst Jr., Milwaukee Malleable & Grey Iron Works, Milwaukee; R. N. Coe, Canton Malleable Iron Co., Canton, O.; H. N. Albright, Columbia Malleable Castings Corp., Columbia, Pa. Directors absent are F. O. Parker, Dayton Malleable Iron Co., Dayton, O., and F. E. Shumann, Lehigh Foundries Inc., Easton, Pa.



COLLINS L. CARTER

JAMES H. SMITH

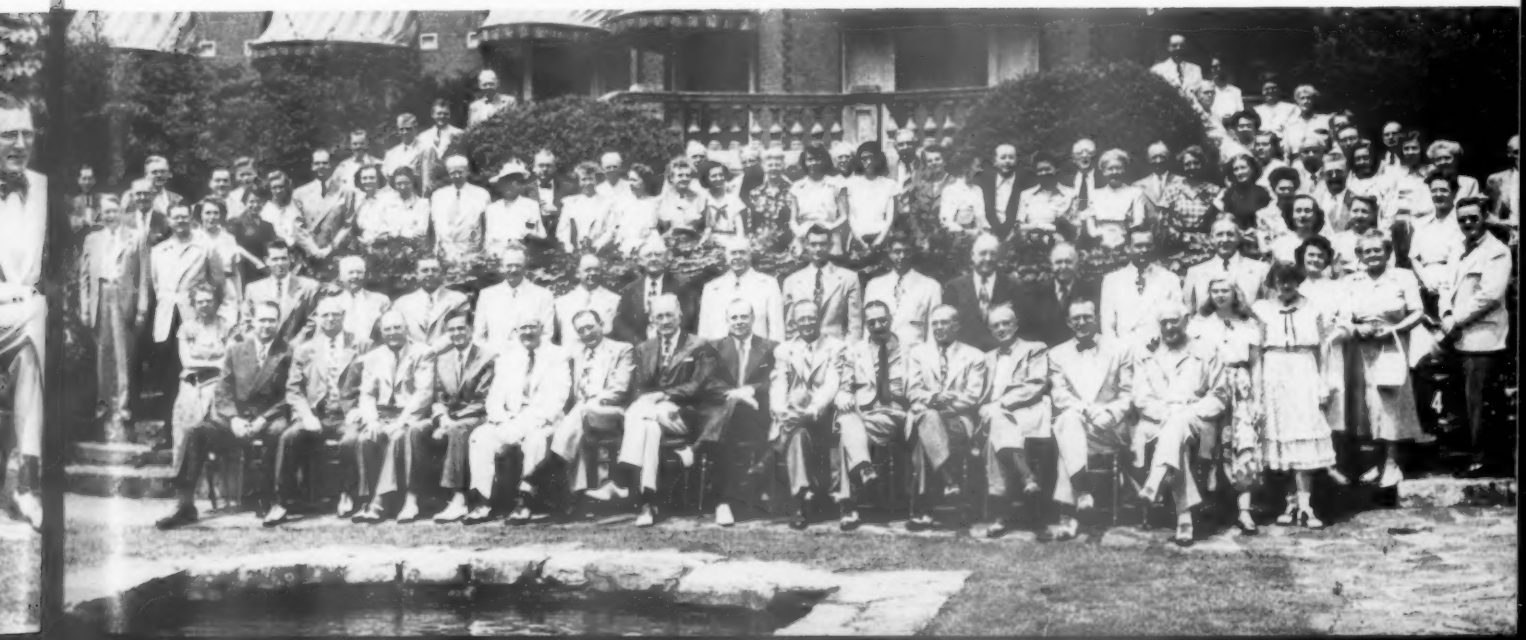
Fig. 2—Robert R. Fauntleroy, Moline Malleable Iron Co., St. Charles, Ill., recipient of the Charles H. McCrea medal for 1948 for distinguished service to the malleable iron industry

Fig. 3—Collins L. Carter (left), newly elected president, and Wilson H. Moriarty, retiring president of the society

Fig. 4—Scene at Hot Springs, Va., during the recent annual meeting of the Malleable Founders' Society

wards the improvement of the malleable iron industry.

Mr. Fauntleroy was a member of the executive committee of the American Malleable Castings Association for a number of years, acting as president in 1929. He served on the board of directors of its successor organizations, the Malleable Iron Research Institute and the Malleable Founders' Society, and was president in 1933 and 1934. As president of the Malleable Founders' Society, he took an active interest in preparing and presenting a proposed "Code of Fair Competition" for the malleable industry to the government administrator in 1933. Prior to the war he was active in gaining government recognition of the industry, and during the war he was chairman of the Malleable Industry Advisory Committee to the Office of Price Administration and spent a great deal of time in Washington serving the industry in that connection. Throughout his business career he has been active in promoting broader and more useful applications of malleable iron which has resulted in its expanded use on many household appliances, transportation elements such as passenger cars, automotive trucks and rail- (*Please turn to page* 136)



WHEN AND HOW TO USE Gray Iron

By T. E. EAGAN
Chief Metallurgist
Cooper-Bessemer Corp.
Grove City, Pa. and Mt. Vernon, O.

THE title of this paper is presumptuous to say the least. Each individual design must be considered in the light of the service intended, and then the type of material may be intelligently chosen. Therefore, it is the prerogative of the designer to say when to use gray iron. All that possibly can be done is to present its physical properties so that the designer can make his decision.

The gray iron of today is a great deal different from the gray iron we knew some twenty years ago. It is no longer a material to be used only for its castability and its cheapness with very low tensile strength and extreme brittleness. Metallurgists have improved its quality to the point that it is an engineering material which if properly applied will give outstanding performance. We can only touch briefly on each of the physical properties that have been developed and refer one to a more complete compendium for further information.

Gray iron can be very broadly called steel plus graphite. Microscopically a good grade of material will appear as shown in Fig. 1. The gray streaks are graphite and the thumb print material is that found in annealed .90 carbon steel.

The graphite occupies 11 to 17 per cent of the volume of the metal, depending on the analysis and the cooling rate of the casting, and controls to a large extent its physical characteristics. If we could put all of the graphite in a ball and locate it in one spot in the center of a casting as shown in the left diagram of Fig. 2, it would have little effect on the strength. However, if it is put as a slab across the piece as shown in the right diagram, we would have no strength whatsoever. Therefore, by controlling the distribution of the graphite and its amount we can produce various strengths of gray iron. The different ways we can distribute the graphite have been studied thoroughly and are published by the ASTM as Specification A 247-41T.

The matrix metal will have the tensile strength of steel, which has the same analysis and microstructure. This may vary from pure iron or almost a pure iron, with a tensile strength of around 40,000 psi, to a pearlitic steel as shown before with a tensile strength of 120,000 psi. By controlling the distribution, size, and amount of the graphite flakes we can produce tensile strengths between 10,000 psi and 60,000 psi quite readily and over 60,000 psi with the use of alloys and special control technique. The ability to do this is the foundryman's problem and although it is a very interesting subject we cannot enter into it any further at this time.

Tensile Strength—Due to the fact that tensile strength of gray iron indicates to a certain extent the other properties desired, the general rule has been to specify it as the controlling criterion for the

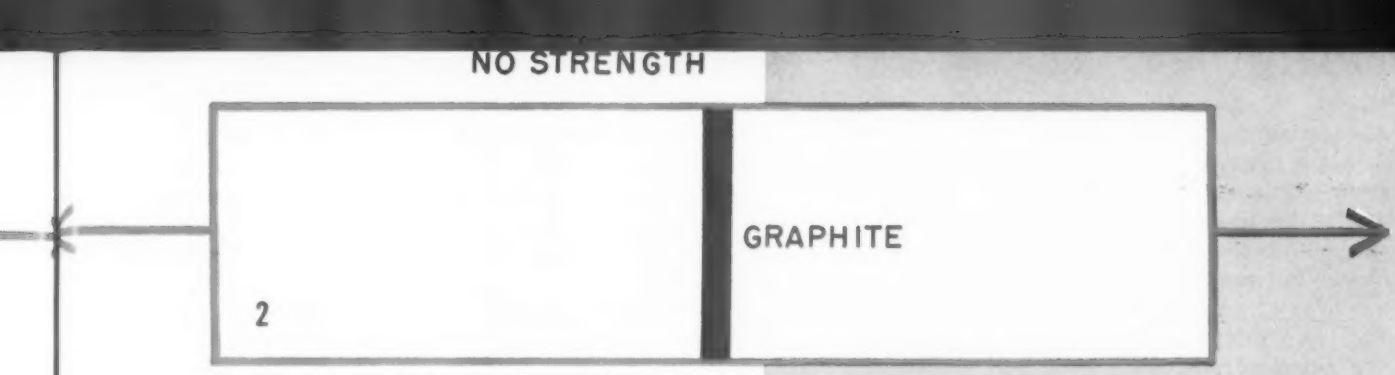


Fig. 1—Microstructure of a good grade of gray iron (X500. Etched—picral plus HCl)
Fig. 2—Illustrating the influence of graphite on tensile properties of gray iron
Fig. 3—Influence of section size on tensile strength and brinell hardness
Fig. 4—Typical tensile strength of castings with ½ to 1-in. wall thickness
Fig. 5—Yield strength (0.2 per cent offset) of castings with ½ to 1-in. wall thickness

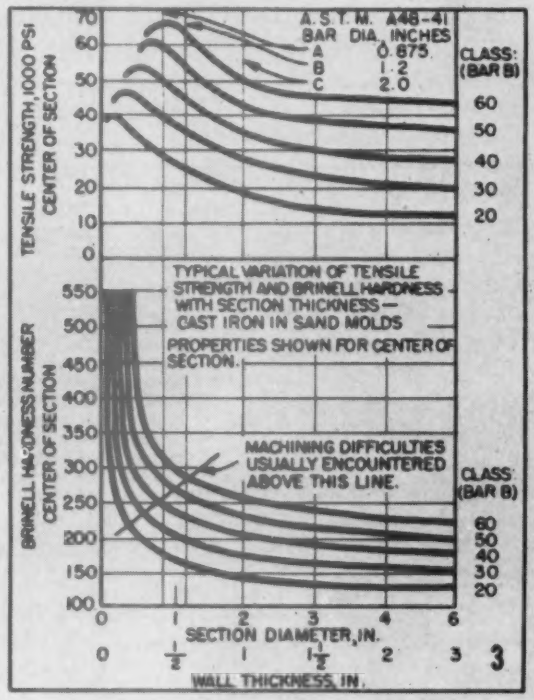
purchase of castings. This is done mostly by using the ASTM specification A 48-46 which gives the various classes of gray iron normally available. The tensile strength thus designated is taken from a separately cast test bar not attached to the castings, and various sizes of these test bars are used depending on the section thickness of these castings. Table I gives a summary of this specification.

Other specifications covering the use of gray iron in rather special applications involving large volume have been published. Such a specification is shown in Table II which covers the automotive type of gray iron.

Why have we seven different classes of gray iron? In the first place, the lower the class of iron designated, the cheaper it is. Thus the problem of economics enters into it. Secondly, the higher classes of iron are very difficult to cast into thin sections. The table indicates the usual minimum sections that can be economically used; however, they are not mandatory. Should one wish to use thinner sections than are indicated, the foundryman should be consulted to see if the design of the casting will allow it to be gated so as to permit the iron to flow through these thin sections.

Section thickness has a great deal to do with the tensile properties obtained in any casting. The upper part of Fig. 3 indicates to a large extent what happens to the tensile strength of gray iron castings as the section thickness increases or decreases from the size of the arbitration bar used. The slope of these curves is rather steep as we change section size in the thinner sections, but as we increase the size of the section they tend to flatten out so that in these thicker sections there is less change. There is also a tendency for the higher class of cast irons to show less drop in tensile strength than the lower material.

The fundamental thing that controls the tensile strength of the material in any gray iron casting is the rate at which it cools from the molten metal down to a temperature around 1000° F. It can be definitely stated that for any given analysis of material the tensile strength obtained in the casting is


A.S.T.M. A48-41
BAR DIA. INCHES
A 0.875
B 1.2
C 2.0
CLASS: (BAR B)
TENSILE STRENGTH, 1000 PSI CENTER OF SECTION
BRINELL HARDNESS NUMBER CENTER OF SECTION
TYPICAL VARIATION OF TENSILE STRENGTH AND BRINELL HARDNESS WITH SECTION THICKNESS — CAST IRON IN SAND MOLDS
PROPERTIES SHOWN FOR CENTER OF SECTION.
MACHINING DIFFICULTIES USUALLY ENCOUNTERED ABOVE THIS LINE.
SECTION DIAMETER, IN.
WALL THICKNESS, IN.
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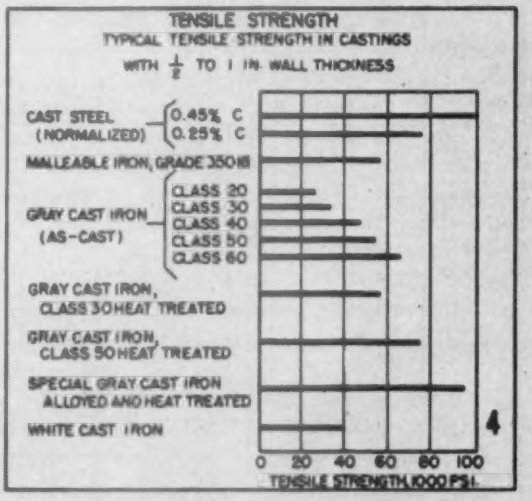
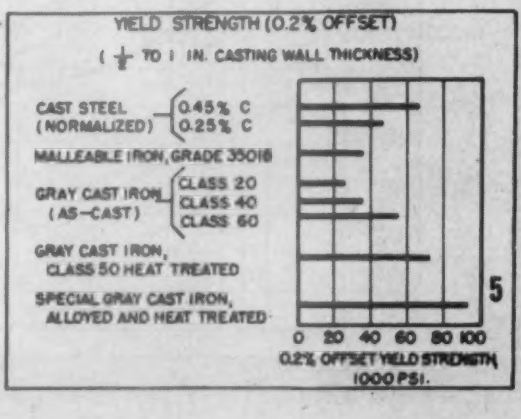

TENSILE STRENGTH
TYPICAL TENSILE STRENGTH IN CASTINGS WITH ½ TO 1 IN. WALL THICKNESS
CAST STEEL (NORMALIZED) 0.45% C 0.25% C
MALLEABLE IRON, GRADE 35018
GRAY CAST IRON (AS-CAST) CLASS 20 CLASS 30 CLASS 40 CLASS 50 CLASS 60
GRAY CAST IRON, CLASS 30 HEAT TREATED
GRAY CAST IRON, CLASS 50 HEAT TREATED
SPECIAL GRAY CAST IRON ALLOYED AND HEAT TREATED
WHITE CAST IRON
TENSILE STRENGTH, 1000 PSI.
4


YIELD STRENGTH (0.2% OFFSET)
(½ TO 1 IN. CASTING WALL THICKNESS)
CAST STEEL (NORMALIZED) 0.45% C 0.25% C
MALLEABLE IRON, GRADE 35018
GRAY CAST IRON (AS-CAST) CLASS 20 CLASS 40 CLASS 60
GRAY CAST IRON, CLASS 50 HEAT TREATED
SPECIAL GRAY CAST IRON, ALLOYED AND HEAT TREATED
0.2% OFFSET YIELD STRENGTH, 1000 PSI.
5

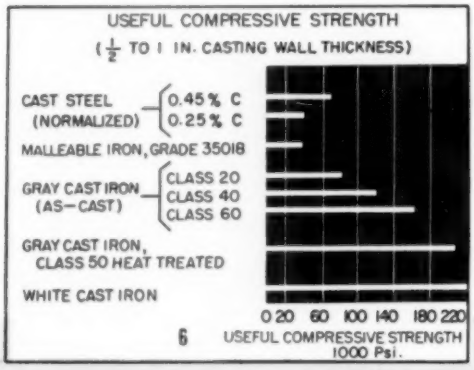
a function of its cooling rate. Unfortunately, there is not a great deal we can do about the cooling rate of any given casting because this is primarily controlled by the design of the casting, the size of the flask used, the method of gating, the sand used, etc. These are pretty well fixed by the foundry practice required to produce sound castings. Therefore to obtain any required tensile strength we must control the chemical analysis. It is entirely possible to do this. The practical aspects of the methods used are very complicated and require a considerable knowledge of the metallurgy of gray iron, but, it is being done regularly with success. If a certain tensile strength is needed in a casting, nine out of ten times the foundryman is able to do what is desired if the buyer is willing to co-operate with him on the design.

Fig. 4 indicates the position that cast iron holds in relation to other cast ferrous alloys. It is believed that this chart is self explanatory.

Brinell Hardness—The brinell hardness of gray iron is very broadly proportional to the tensile strength. This relationhip is not as close as it is for steel. MacKenzie[1] gave the equation Tensile Strength = 1.82 $(Bhn)^{1.85}$ for this relationship after studying 1553 tests. It must be pointed out, however, that this equation will give only approximate results.

The relation of brinell hardness to section size is shown in Fig. 3. Again this is a rather broad relationship.

It has been found that the maximum economical



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. . . Gray Iron . . .

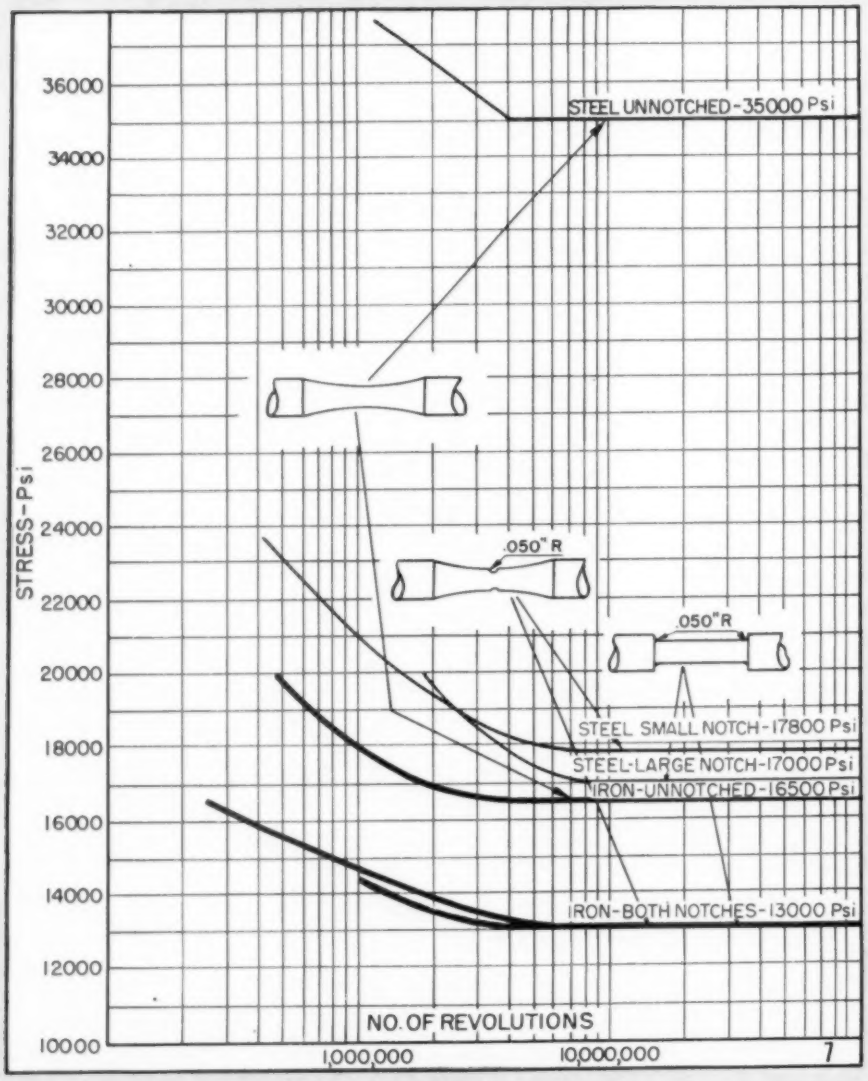

Fig. 6 — Useful compressive strength of ferrous castings

Fig. 7—Effect of notches on endurance limit of steel and gray iron

Fig. 8—Cast gray iron crankshaft showing contouring to eliminate stress concentration

Fig. 9—Stress-relieving contours

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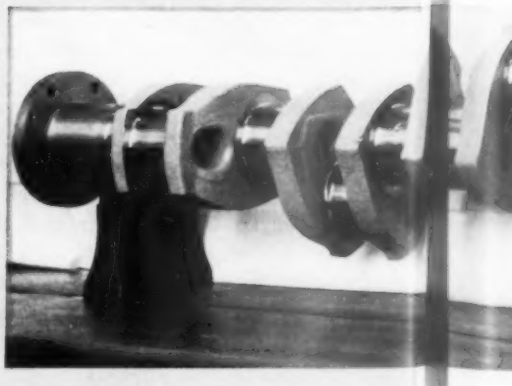

machinable hardness of gray iron is about 250-260 brinell. However, the lower strength gray irons will usually give lower hardness than this and thus give better machinability.

Because of the broad relationship between tensile strength and brinell hardness it is not recommended that both be specified. However, a maximum brinell hardness can be specified to insure machinability. This should only be done in consultation with the foundry making the piece.

Yield Point—In design work it is usual to avoid stresses higher than the yield point of the material if the material is to be subjected to static loading. The yield point of gray iron is very close to the tensile strength, thus it is possible to use the material at higher stresses. Fig. 5 shows the comparative yield strength of some of the cast ferrous alloys. It can be seen that the yield point of gray iron is comparable to that of low carbon cast steel.

Compression Strength — One of the outstanding characteristics of gray iron is its compression strength. In fact, in compression gray iron is much stronger than steel. Fig. 6 will give an idea as to this quality of gray iron. It will be noted that gray iron in all classes is much stronger than cast steel.

Shear Strength — The shear-tension relationship varies between 1.0 and 1.6, and the ratio between shear and tensile strength decreases as the strength of the metal increases.[2]

Torsional Strength—Not much information is available on the relationship of torsional strength to tensile strength. The ratio seems to run for solid specimens between 1.2 to 1.4 but these values must be used with caution.

Modulus of Elasticity—In design work the modulus of elasticity is an important factor in most calculations. The modulus of elasticity of gray iron runs somewhere between 12 million and 22 million psi depending on the tensile strength, the amount and distribution of the graphite, and microstructure of the matrix. However, these figures must be used carefully because cast iron is a heterogeneous material and does not fulfill the requirements of homogeneity, isotropy, and elasticity as required by the elasticity theory.

We find many cases where cast iron behaves completely different than would be expected by the elasticity theory. We can only state here that the shape of the section influences the stress distribution and that as the load increments are increased the neutral axis shifts and the stress distribution line follows a curve instead of a straight line such as is found in a homogeneous material such as steel. A rather complete discussion of the proper use of the elasticity theory formulas for cast iron is presented in the *Cast Metals Handbook* published by the American Foundrymen's Society.

Endurance Limit — Parts subjected to dynamic forces are usually designed so that the stresses imposed are below the endurance or fatigue limit. In gray iron the theoretical endurance limit is between 35 and 50 per cent of the tensile strength. The 35 per cent applies to a very large section whereas the 50 per cent would apply to smaller sections which are comparable in cooling rate of the 1.2-in. arbitration bar. For most sections an arbitrary figure of 40 per cent of the tensile strength can be safely used. As all designers and engineers know, the use of the theoretical endurance limit is subject to modification because of design and service requirements. This is true of any material. Let us consider one or two of these factors as they affect gray iron.

Notch Sensitivity—Gray iron is much less notch sensitive than steel. This fact will be amply illustrated in Fig. 7 which shows the endurance limit in reverse bending of steel unnotched and notched as shown. The steel was a SAE 1040 steel heat treated to 80,000 psi tensile strength. The tensile strength of the gray iron was 49,000 psi. In the case of steel the reduction of the endurance limit caused by the notches was 50 per cent. In the case of iron the reduction was 21 per cent.

Let's stop here and consider how this applies to the use of cast iron. Take for an example a piece that could be made of steel or of gray iron. The steel we could use would have a tensile strength of 80,000 psi and in the case in hand it had an endurance limit of 35,000 psi and, because of the notches in the design, we would have to use the maximum allowable stress of 17,000 psi. Now the cast iron has a tensile strength of 49,000 psi and an endurance limit of 16,500, but because of its non-notch sensitiveness we can use a maximum allowable stress of 13,000 psi, which is only 4000 psi less than that for steel. Because of the factor of a safety usually used it would be amply safe to use the cast iron in place of the steel.

Please do not take this as a condemnation of steel nor that it is claimed that cast gray iron will always

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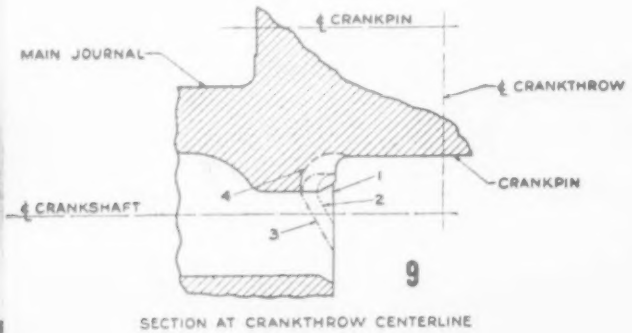


SECTION AT CRANKTHROW CENTERLINE

take the place of steel.

As expressed in the following remarks of Alexander Finlayson[3]: "Steel and iron cannot really be compared solely on the basis of the engineering characteristics of steel any more than they may be compared solely on the basis of the engineering characteristics of iron, because steel exhibits some properties which iron does not possess but which are nevertheless of no value whatever in applications where iron is indicated. Conversely, iron possesses some unique properties which may be completely lost when applied in places where steel would manifest a better engineering balance. For example, static tensile properties and especially the ductile properties, fall far into the background in importance in comparison with anti-friction and notch sensitivity, or crackless plasticity. When we are thinking about crankshafts in the first reference, the bearing lubrication and anti-seizing characteristics of iron are far superior to those of steel and far more important than unapplied tensile strength and ductility or their ability to be plastically deformed without bending; whether a crank bends or breaks it is equally useless.

"A bar of soft ductile steel may be caused to fail with a brittle fracture if the stress is concentrated in a notch, but because of the random distribution of graphite in properly made high tensile iron a sudden stress cannot travel along a single plane or in a straight line but will be diffused and distributed in many directions, and unless very severe, will not induce cracks at a localized point and so cause failure".

With further reference to the notch effect of stresses, a considerable amount of relief can be effected by proper contouring. However, this contouring must be done intelligently and the use of the new SR-4 strain gages can be a great help.

To present an appropriate example of what can be done, Fig. 8 is a cast gray iron crankshaft having a tensile strength of over 65,000 psi. The notch effect at the fillets between the webs and the pins and journals normally impose a stress concentration of over 2 to 1 for a forged steel shaft and a 1.75 to 1.00 for this high tensile iron. However, by contouring as shown this stress concentration is reduced. The shape of this contour[5] was determined by the use of SR-4 strain gages, as illustrated in Figs. 9, 10 and 11. It can be readily appreciated that such contouring is only practical in a cast shaft as it is almost impossible to machine such a contour economically.

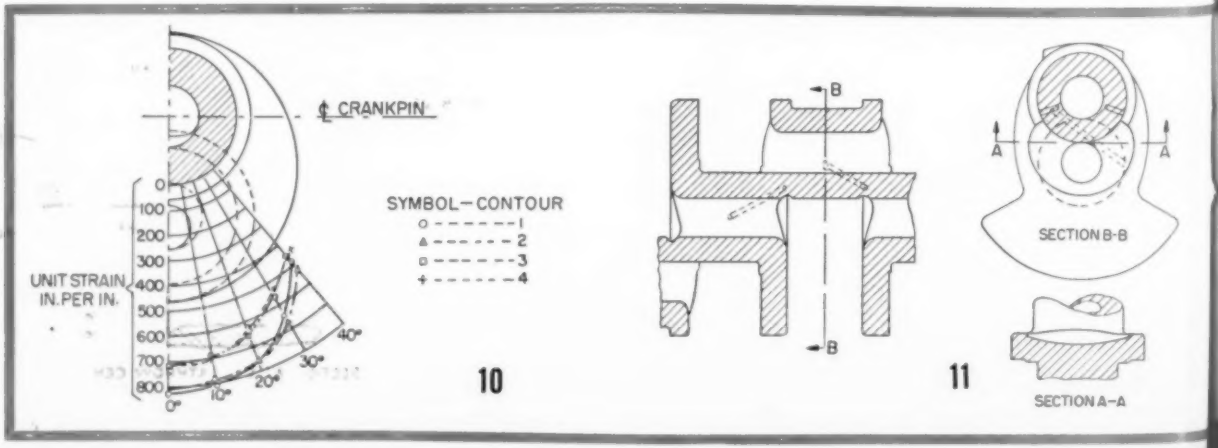
Damping Capacity—Under dynamic operation many failures of parts are caused by the surge of vibration that may be set up in the piece due to the dynamic forces. This is amply brought out, of course, in the critical vibration experienced in crankshafts in internal combustion engines. This critical vibration can and does, at times, break parts in operation.

Gray iron has excellent damping capacity. The energy absorbed per cycle is in the range of ten times that of steel.[4] The lower the tensile strength of the iron the higher the damping capacity. One of the best ways to demonstrate damping capacity is the one used in many machine shops for identifying the material in a casting; that method is to strike the casting. A steel casting will ring while the cast iron casting will produce nothing but a dull sound. It is difficult to apply specific damping capacity calculations to design but it is always well to know that it is present in gray iron.

Impact and Brittleness—Gray iron is much more brittle than steel. Thus when gray iron breaks, it breaks with a brittle fracture while steel, being ductile, will break with a ductile fracture. The standard impact tests, such as Izod and Charpy, show gray iron to have much lower values than steel.

However, testing things to destruction sometimes gives us a false impression. We design things so that the forces applied are well below the elastic limit of the material used; thus we get no permanent deformation. If this were not so we would certainly have considerable difficulty with fits and running clearances. Therefore any amount of permanent deformation would no doubt be serious. Thus the amount of deformation we get under any impact below that required to fracture is of importance. In many cases a blow breaking cast iron will deform the steel to such an extent as to make it useless.

To demonstrate this we took a piece of steel and attached to it a piece of cast iron of the same size and dimensions, as shown in Fig. 12. The steel had 91,000 psi tensile strength and the cast iron had 54,000 psi. We attached a lever arm on the pieces, held the other ends from twisting, as illustrated, and dropped a weight on this lever with such force that the cast iron was broken. We found that the iron shaft twisted 6 degrees before breaking and that the steel



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shaft, although it was not broken, twisted 35 degrees, which of course would have made it useless. The usable impact resistance of cast iron was sufficient for the service intended.

Castability—Gray iron is the most castable of all the ferrous metals. It will flow into thinner section and usually requires small or no risers. However, as the tensile strength increases the castability gets less, requiring more risers and an approach to the steel casting practice in molding. This is an important consideration when intricate designs are involved. However, gray iron lends itself to much more complicated designs than do many of the other cast metals. This is a very important characteristic of gray iron. One outstanding example of it is the automobile engine block and head. These are masterpieces of intricate design which could not be easily cast in any other ferrous metal but gray iron.

Machinability — Gray iron properly handled is a very machinable material. This is demonstrated in Fig. 13. It will be noted that the lower tensile irons are much more machinable than the higher tensile materials.

One of the complaints usually made about gray iron is the problem of hard edges. This is annoying to say the least, especially so when they are not necessary. By proper molding practice, proper control of the analysis of gray iron and proper design they can almost always be eliminated. To illustrate, in our foundry we have made many thousands of tons of gray iron castings of all ASTM classes. We very seldom hear of hard-edged castings because the iron is properly designed metallurgically and mechanically, properly molded and properly controlled.

Wear Resistance—In sliding friction gray iron is outstanding. This is amply demonstrated by the fact that practically all engine cylinders or liners are made of gray iron, as are piston rings, clutch plates, cable and brake drums, machine tool ways, gears, and in some cases it has been used as a bearing material. Microstructure of the iron has a great deal to do with its wearing qualities. The general rule is that the iron should have a random flake distribution of the graphite and a matrix that contains no free ferrite. To insure this a minimum brinell hardness of 190 can be required. The type of microstructure shown in Fig. 1 will give good wear resistance, while the type shown in Fig. 14 will give exceedingly poor wear resistance. The addition of alloys to refine the structure usually increases the wear resistance.

In abrasive wear resistance gray iron also does a good job. However, if the iron is hardened by heat treating the wear resistance is sometimes increased, and in the case of very abrasive conditions a white or chilled alloy cast iron such as Ni-hard is usually indicated.

Corrosion Resistance—Another quality of gray iron is its good corrosion resistance. This is amply demonstrated by the fact that most water mains have been made of cast iron and there are examples where they are in good condition after 100 years service. Cast iron heads, cylinder liners, and blocks in engines which are salt-water cooled have been used for years with excellent success. However, where more vicious conditions such as mild acids are encountered, special corrosion-resistant grades are available.

Heat Resistance—Gray iron has good heat-resistant qualities. This particular quality has, as a rule, not been exploited as much as it should be. Recently the ASTM has developed a specification for the use of gray iron for use in pressure vessels at temperatures up to 650° F. We also know that it has been successfully used in non-pressure vessels such as molten metal pots, etc., for temperatures above 1200° F. It will not, however, replace the higher alloy heat-resisting steel castings where service conditions require the specific qualities inherent in these materials.

One of the complaints about gray iron is its tendency to grow when heated about 900° F. However, where this is a factor, proper alloying of the iron can eliminate this tendency to a great degree.

Density—Because gray iron is a combination of graphite and steel its density is lower than that of steel. The range of specific gravity is 7.00 to 7.8. This would be approximately 437 to 487 lb per cu ft or 0.26 to 0.29 lb per cu in. The high-tensile-strength gray irons have the highest density.

Thermal Conductivity—The thermal conductivity of gray iron varies from 0.100 to 0.140 cal per sq cm

. . . Gray Iron . . .

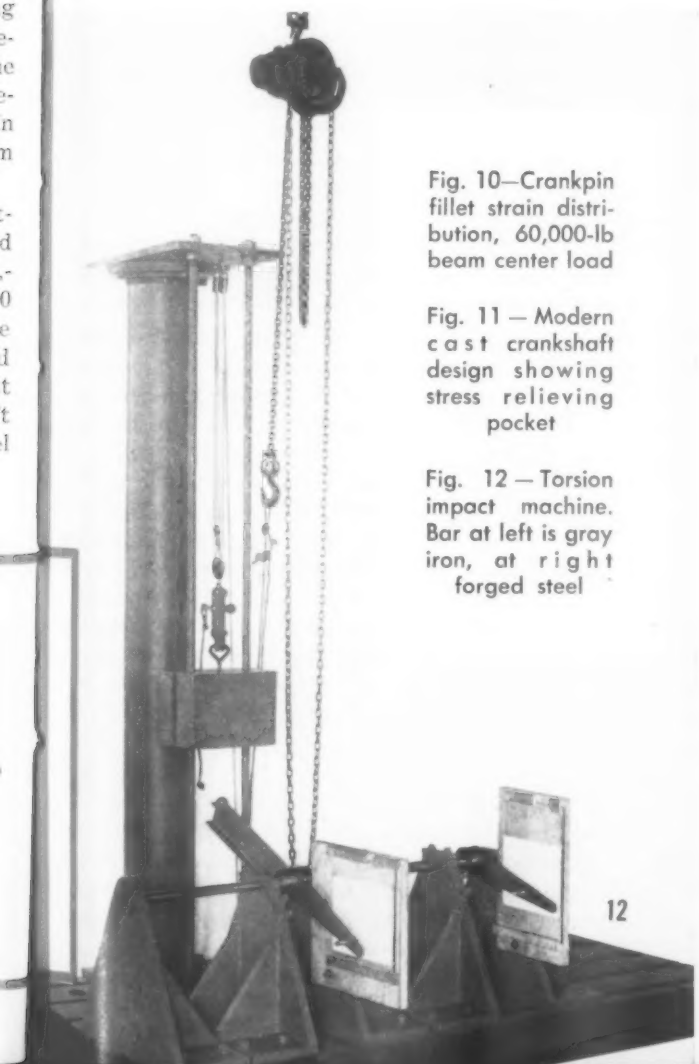


Fig. 10—Crankpin fillet strain distribution, 60,000-lb beam center load

Fig. 11 — Modern cast crankshaft design showing stress relieving pocket

Fig. 12 — Torsion impact machine. Bar at left is gray iron, at right forged steel

. . . Gray Iron . . .

per sec per cm per °C.

Thermal Expansion—The coefficient of linear expansion is between 6.5 × 10^{-6} and 6.9 × 10^{-6} per °F for ordinary temperatures. The higher tensile strength materials have the higher coefficient. These values change with temperature range and the amount of alloys used. A larger work, such as the *Cast Metals Handbook*, should be consulted for more exact figures.

Specific Heat—The specific heat of solid gray iron is about 0.13. This also changes slightly with temperature range and type of gray iron but not sufficienlty to affect normal calculations.

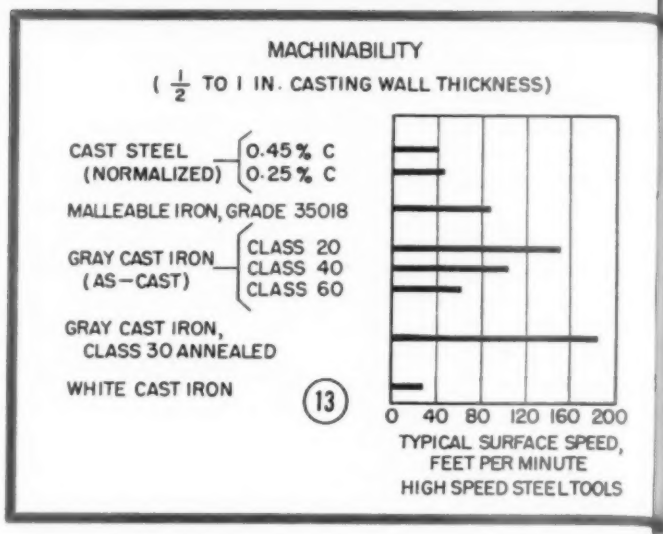
Chemical Analysis — Chemical analysis of the iron controls to a large extent the physical properties of the casting, chiefly because there is so little we can do to control the cooling rate of the casting in the mold. It would seem logical therefore that the one thing that should be specified is the chemical analysis. However, this is far from the truth; in fact, it is dangerous to do so. The method by which the casting is poured will influence the cooling rate tremendously, and in many cases there are a number of ways to do this to achieve the same result.

The only man who is in a position to specify the proper analysis for a given casting in which the desired physical properties are specified is the foundry metallurgist who must make his decision after he sees the method of molding, the gating, etc. Thus it is far safer to let the foundry specify its own analysis. This is well recognized by the fact that the ASTM specifications deliberately do not specify chemical analyses. All foundrymen are perfectly willing to work to a tensile strength specification, but many will absolutely refuse to work to tensile strength and also chemical analysis.

Heat-Treatment—Gray iron can be heat treated the same as steel. It is possible to almost double the tensile strength by heat treatment. However, this involves a quench and tempering treatment and can be applied only to very simple shapes. Complicated shapes will crack during the quenching operation. The increase in tensile strength by heat treatment is sometimes dangerous to use because it does not proportionately increase the endurance limit of the iron; therefore one can be greatly misled when such heat treated materials are subjected to dynamic forces.

Complicated castings of gray iron, especially those in the range of 40,000 to 60,000 psi, usually have a considerable amount of residual stresses in them. Thus in subsequent machining they are liable to distort. These stresses can very safely be removed by a stress-relief anneal. This process consists of very slowly heating the casting to about 1000-1050° F, holding it there for about one hour per inch of heaviest section and cooling it very slowly.

A word about the idea of aging of gray iron castings. It has been believed for years that the best way to relieve casting stresses was to set the casting out in the yard for six months to a year, and the stresses would be relieved. Experiments have shown that this is not the best or most economical way to relieve the stresses. It is much more economical and a much better practice to give the castings a stress-relief anneal.



Gray iron can also be hardened by quenching and tempering. The maximum hardness that can be obtained is about 550-600 brinell. This hardening treatment is of great value where abrasive wear is encountered, such as the ways of lathes and machine tools, and certain dies. Sometimes diesel engine liners are hardened. Any of the usual methods of hardening can be employed plus austempering, martempering, flame hardening, or induction hardening.

Some use is made of a direct annealing process on certain pieces of gray iron to improve machinability. Annealing definitely lowers the physical properties of the casting and should not be used unless these physical properties are of no consequence. I have always deplored the idea of annealing castings. I believe that it could be avoided in most cases by proper foundry practice. It is an unnecessary expense. This is not true of castings made in permanent molds.

The unique engineering properties of gray iron can be put to use only with proper designing. Gray iron is one of the most castable of all metals, but certain principles of good design for cast metals must be followed in order to produce results.

The production of a sound and serviceable part made of gray iron is the prime interest of the foundryman who is to make it. In order to do this he must decide on the method by which he will mold and pour the part. The design of the part will influence the decisions; therefore it is extremely important that designers consult with the foundryman about the design of any part to be cast. This point cannot be stressed too greatly. It is seldom that a designer has intimate knowledge of the foundryman's problems but by consultation these can usually be solved to the advantage of both. No set of rules or instructions can adequately cover all situations; they will, in many cases, severely limit the designer, yet his actual idea may lend itself admirably to being cast in gray iron. Consultation between foundrymen

TABLE I—Summary of Gray Iron Specification*

	Tensile Strength Minimum psi	Usual Minimum Wall Thickness—Inches
No. 20	20,000	1/8
No. 25	25,000	1/8
No. 30	30,000	1/4
No. 35	35,000	5/8
No. 40	40,000	1/2
No. 50	50,000	1/2
No. 60	60,000	3/4

Size of Section, Ins.	Nominal Diam. of Test Bar, Ins.
0.50 and under	0.875
0.51 to 1.00	1.20
1.01 to 2.00	2.00
Over 2.00	Larger bars by agreement between manufacturer and purchaser.

* ASTM Specification A 48-46.

TABLE II—Automotive Type Cast Iron[1]

SAE No.	Hardness Bhn	Transverse Lb Min	Deflection In. Min	Tension psi Min
110	187 Max	1800	0.15	20,000
111	170-223	2200	0.20	30,000
120	178-241	2400	0.24	35,000
121	202-255	2600	0.27	40,000
122	217-269	2800	0.30	45,000

[1] Properties determined from arbitration test bar (1.2-in. diam. broken on 18-in. supports). ASTM specification No. A 159-47 is identical with the above.

Fig. 13—Comparison of machinability of various cast ferrous materials

Fig. 14—A type of microstructure of gray iron having poor wear resistance (X500. Etched—picral plus HCl)

and designers pays dividends.

Certain rules can be used to advantage by the designer, although he should not despair should his design fail to completely obey them. Consultation with his foundryman frequently will straighten out the trouble. The foundryman is usually a clever fellow. A detailed discussion of these rules is given in the first five chapters of the *Cast Metals Handbook*.

Most molten metals will shrink on freezing. Foundrymen therefore will mold, gate and riser castings so that the metal will freeze in one direction so that there will be a supply of molten metal to fill in the shrinkage due to freezing. This is known as progressive solidification and most of the rules are aimed at making this possible.

The first rule is that the sections of the casting should be as uniform as possible. However, where it is necessary to change section size it should be done as gradually as possible. Taper blending is better than filleting.

The second rule is that junctions between sections cause what is known as a hot spot; that is, there is more mass of metal at this point than the component parts. These can be avoided by staggering these junctions or, if this is not possible, a small cored hole can be provided to give a more uniform mass.

Small holes which require finished and accurate location are usually drilled and not cored. However, large holes are often cored with a finish allowance for machining. Small holes not to be machined are often cored.

Cores in castings are always expensive, therefore considerable thought should be given to their avoidance. It is often more economical to make the piece in two parts and bolt them together than to require intricate cores. However, if they are necessary they should be designed so that they can be amply supported, and holes should be provided so that the core sand can be removed after casting.

The design of the casting should be such that it can be divided in half without an irregular parting line. Again the foundryman often has ingenious methods that can help where this is not possible.

Tee and H sections are desirable because of their uniform cross section.

Acknowledgment—I have borrowed quite liberally from various sources for the information presented. The charts shown in Figs. 3, 4, 5, 6 and 13 are taken from a symposium on "The Engineering Properties of Cast Iron" prepared by W. E. Mahin and H. W. Lownie Jr. and are by courtesy of the American Foundrymen's Society. The engineering staff of the Cooper-Bessemer Corp. has been most liberal with its information.

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2. J. O. Draffin, *Cast Metals Handbook*, AFA, 1944 edition, p. 394.

3. Alexander Findlayson, technical director, Pacific Car & Foundry Co., Renton, Wash., private communication.

4. N. G. Meagley, "Cast Iron Offers Combination of Properties Not Found in Other Materials," *Materials and Methods*, February 1948, p. 83.

5. H. M. Hardy and T. O. Kuivinen, "Strain Testing of Meehanite Castings," published privately by the Cooper-Bessemer Corp.

COLLAPSIBLE WIRE BASKETS Speed

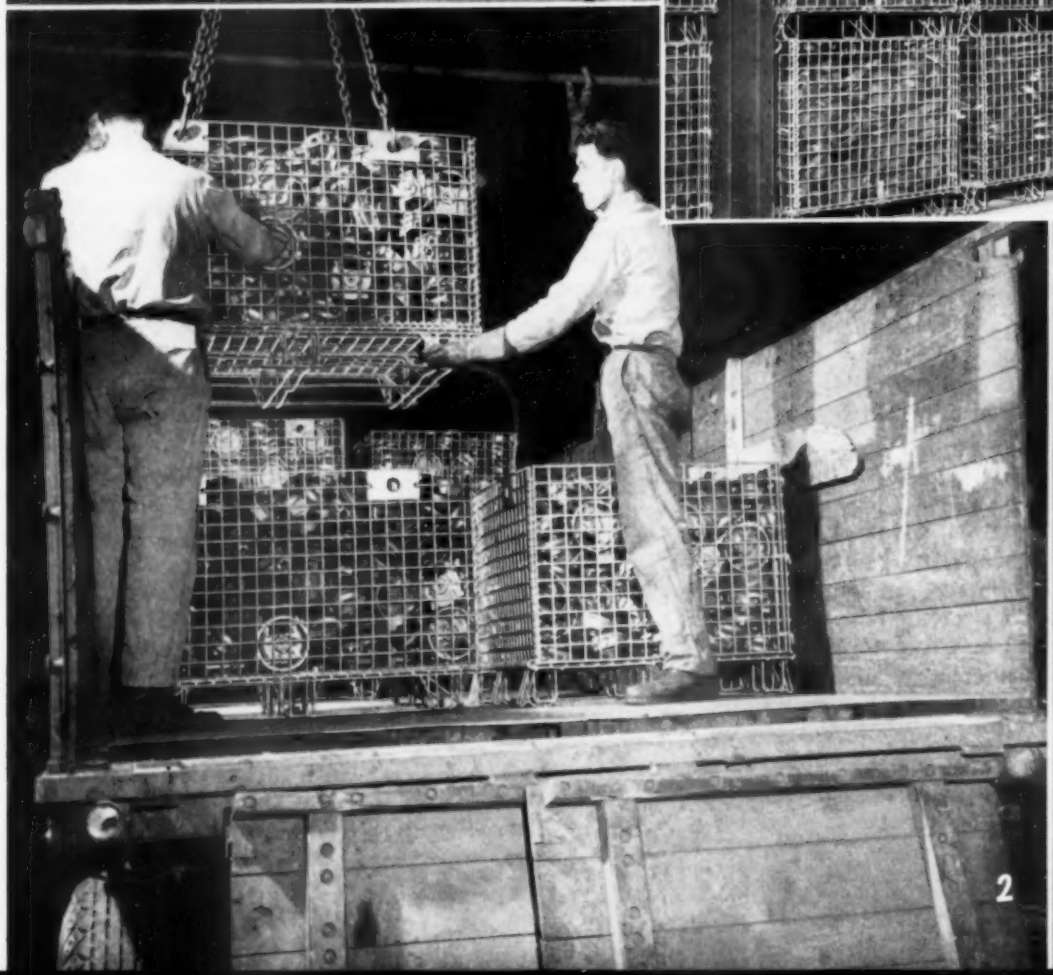


Fig. 1—Empty baskets received in bundles of six are unfolded and placed at the end of the foundry conveyor

Fig. 2—Loaded baskets are shipped between foundry and assembly plant by truck or rail. As shown here they are being stacked two-high in the truck

Fig. 3—Baskets can be stacked when loaded. They are easily handled by crane or fork truck

Casting Handling

HANDLING small motor bracket castings has been greatly expedited at the Westinghouse Electric Corp.'s gray iron foundry by the use of collapsible wire containers developed especially for the purpose by the company's materials handling engineers. Breakage of castings has been materially reduced and several laborious handling operations eliminated.

Designed so that they can be moved by crane or fork truck, the baskets can be stacked three or more high when full or collapsed and bailed in bundles of six or more for return shipment. Such a bundle will take about the same shipping space as one full container. They can of course be used for handling any small castings.

Motor bracket castings are shipped from the Westinghouse Foundry at Trafford, Pa., to the small motor plants at Lima, O., and Fairmont, W. Va., by truck or rail. Formerly they were loaded in bulk, being handed into the truck one at a time. On arrival at the destination they were handled individually in the same way. Counting the brackets and four or more handlings of the individual castings have been eliminated with the use of the baskets.

With the baskets in use, castings come off the foundry production line, and are placed in the baskets where they stay until lifted out at the motor assembly line. The count is determined simply by weighing the loaded baskets and subtracting the weight of the container. Cranes then swing the baskets onto a truck. At the other end fork trucks carry the baskets to storage and from storage to the assembly point. When the baskets are emptied at the motor assembly line, they are collapsed and bailed for the return trip.

Fig. 4—Castings are counted by weighing. Basket weight is known. Extra castings are added or removed until the right count is obtained

Fig. 5—Showing how collapsed baskets are assembled for use

Institute of British Fo

CONVENTION SETS R

ONE of the most brilliant, and certainly the best attended convention of the Institute of British Foundrymen was held in London June 9-11, at the occasion of the institute's 45th annual conference. Although the meeting was not an international congress, visitors from many foreign countries were present, including Belgium, Finland, France, India, the Netherlands, Norway, Sweden and the United States.

The annual general meeting of the institute preceded the conference on the morning of June 9. The president, P. H. Wilson, was in the chair. The annual report showed that the membership on Apr. 30 was 4117 compared with 3902 on Apr. 30, 1947. After presentation of the report and of the annual accounts, the president proceeded to award the institute's medals and diplomas.

The Oliver Stubbs medal was awarded to L. W. Bolton, consultant and metallurgist, J. Gardom & Co. Ltd., Ripley, for many years of technical services rendered to the institute. Mr. Bolton is vice chairman of the Technical Council of the institute, and chairman of the Solidification Rate of Cast Iron and of the Raw Materials Substitution subcommittees. He is the author of many papers on cast iron metallurgy and has freely placed his knowledge and experience at the service of the institute.

The E. J. Fox medal was awarded to J. G. Pearce, director of the British Cast Iron Research Association, in recognition of the work he has done on behalf of the industry in that capacity for more than 20 years. Mr. Pearce received the medal from the hands of Mr. Fox himself.

The Meritorious Services medal was awarded to C. Lashly, in recognition of his most valuable and devoted work as honorary secretary of the Newcastle branch for a number of years.

The British Foundry Medal was presented by Barrington Hooper, managing director of Industrial Newspaper Ltd., the donor of the medal, to R. C. Shepherd, Ruston & Hornsby Ltd., Lincoln, for his paper "The Influence of Production Flow on Moulding Methods."

Diplomas of the Institute were presented to R. Coates for his paper on "Foundry Conditions and Personnel for Production," G. L. Harbach for his paper on "Development of Foundry Sand Control," and D. Robertson for his paper on "Loam Molding of Rope Barrel Castings."

The meeting then proceeded to elect its officers for 1948-49. R. B. Templeton, managing director, Ealing Park Foundry Ltd., Ealing, near London, was unanimously elected president. N. P. Newman, managing director, Newman, Hender & Co. Ltd., Woodchester, was unanimously elected senior vice president. J. J. Sheehan, managing director, Coneygre Foundry Ltd., was unanimously elected junior vice president.

President Wilson then read telegrams of greetings received from the American Foundrymen's Society and from the Association Technique de Fonderie of France. The newly elected president, R. B. Templeton,

R. B. TEMPLETON

Elected president of the Institute of British Foundrymen, Mr. Templeton is managing director, Ealing Park Foundry Ltd., London. Following World War I service, he spent 10 years in India, in charge of iron ore mines for Burn & Co., Calcutta. He joined Ealing Park Foundry in 1929. Elected a member of the IBF in 1930, he served as president of its London branch 1941-43. He is well known for his work in connection with high-duty irons, on which he has concentrated.

N. P. NEWMAN

Senior vice president of the institute, Mr. Newman is managing director of Newman, Hender & Co. Ltd., Woodchester, Glos., and a director of N. H. Engineering Ltd., Trowbridge, Wilts. He was elected a member of the institute in 1936. Mr. Newman is vice president of the National Ironfounders Employers' Federation, a member of the council of the Association of Brass and Bronze Founders, and a member of the executive committee of numerous trade associations.

Foundrymen

S RECORD

By VINCENT DELPORT
European Manager
THE FOUNDRY

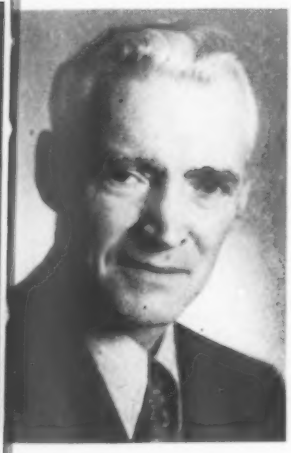
ton, was inducted into the chair and his first act was to propose a vote of thanks to the retiring president, which was received with acclamation.

At a supper dance given on Friday, June 12, a presentation was made by Barrington Hooper to Vincent Faulkner, to commemorate his editorship of the *Foundry Trade Journal* for a period of 25 years.

In his presidential address, Mr. Templeton referred to the problems which industry has to face today, three years after the end of the war. He said "I take comfort in spite of it all, when I think that a hundred years ago William Pitt said 'There is nothing around us but ruin and despair,' and Disraeli said 'There was no hope in industry, commerce or agriculture.'" The speaker expressed the hope that the present state of affairs would soon end and that the fundamental laws of supply and demand would again satisfy our needs, but for the time being some controls are still necessary.

He stressed the importance of research and said that more capital should be spent in that direction. He mentioned the several bodies that are busily engaged in research in Great Britain, and suggested that more could be done by a co-ordinated effort of all these research bodies. At present the Institute of British Foundrymen co-operates with the British Cast Iron Research Association.

Turning to the progress (*Please turn to page* 234)



J. J. SHEEHAN

Junior vice president of the institute, Mr. Sheehan is managing director of Coneygre Foundry Ltd. Following graduation from National University of Ireland, he worked with American mining and smelting plants and with Ford Motor Co. in Detroit, Cork and Dagenham. He has served on the council and technical committees of the institute, is on the council of the British Cast Iron Research Association, and chairman of the research and development committees.

L. W. BOLTON

Awarded the Oliver Stubbs Gold Medal, Mr. Bolton is manager of the Wellingborough foundry of Morris Motors Ltd., engines branch. He has studied iron foundry practice in Europe and America. Mr. Bolton has been a member of the general council and technical council of the institute for many years and has served as chairman of the melting furnaces subcommittee and basic cupola subcommittee. He is active in the British Cast Iron Research Association.

J. G. PEARCE

Recipient of the E. J. Fox Gold Medal, Mr. Pearce since 1924 has been director and more recently secretary of the British Cast Iron Research Association. Educated at University of Birmingham, he spent an apprenticeship period with British Westinghouse Co. Ltd., now Metropolitan-Vickers Electrical Co. Ltd., where he established a research and education department. Mr. Pearce is an Oliver Stubbs medallist of the institute and author of many technical papers.

C. LASHLY

Awarded the Meritorious Services Medal, Mr. Lashly is general commercial manager, Armstrong, Whitworth & Co. Ltd., Close Works, Gateshead. Canadian born, he pursued a military career until 1921, when he joined Armstrong, Whitworth & Co. at the Openshaw Works. Following a period with Splintex Safety Glass Co., London, he returned to Armstrong, Whitworth & Co.'s Close Works, Gateshead, in 1933, and became general commercial manager in 1937.

Aluminum Alloy

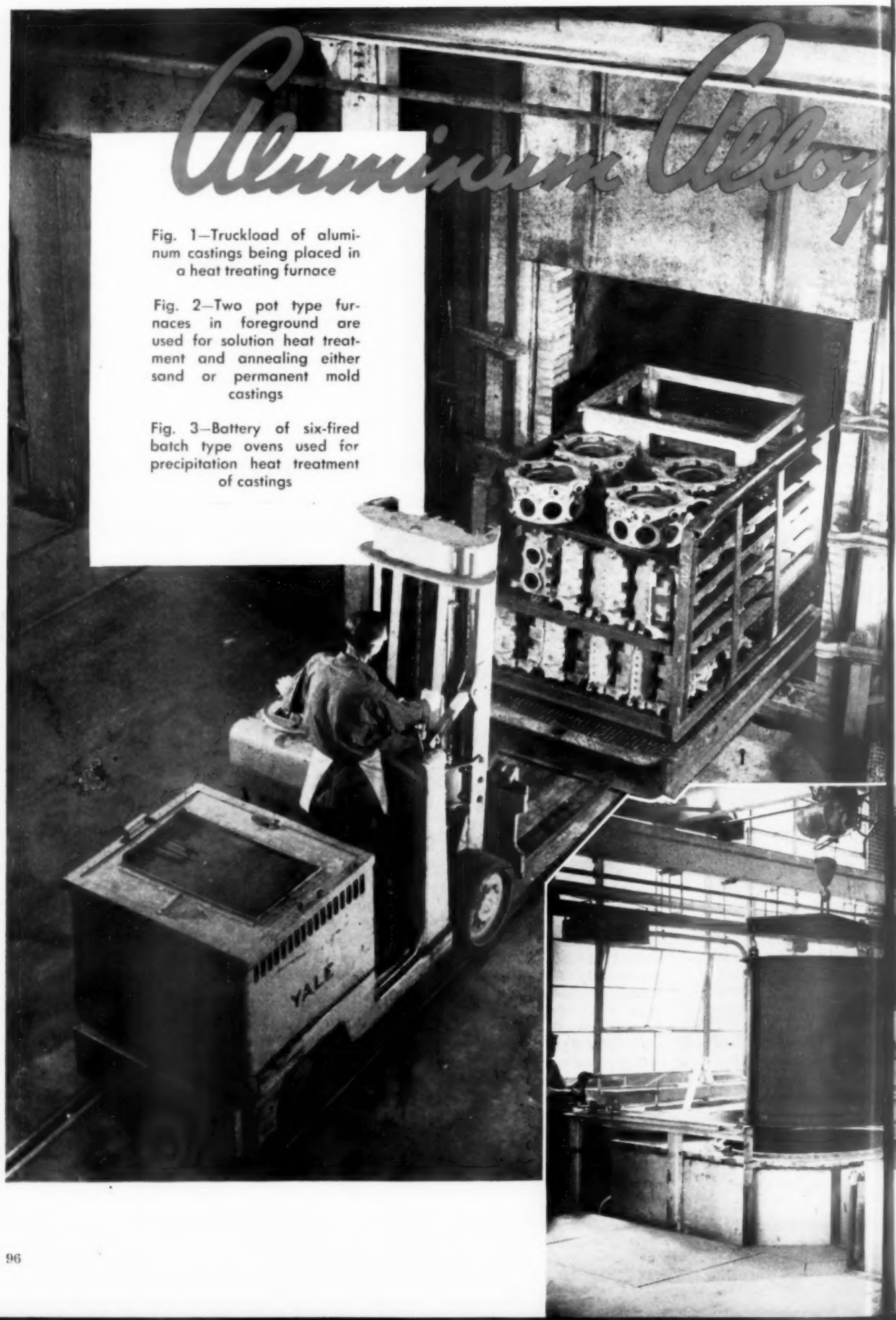


Fig. 1—Truckload of aluminum castings being placed in a heat treating furnace

Fig. 2—Two pot type furnaces in foreground are used for solution heat treatment and annealing either sand or permanent mold castings

Fig. 3—Battery of six-fired batch type ovens used for precipitation heat treatment of castings

By FLOYD A. LEWIS
Technical Consultant
Aluminum Association

Castings

Various forms of heat treatment for improving physical properties of aluminum castings are described in this ninth of a series of articles based on a survey conducted by the Foundry Division of the Aluminum Association

IT HAS been said that nature made aluminum light, but research made it strong.[1] The first noteworthy step in this direction came early in this century when Dr. Alfred Wilm, a German metallurgist, discovered that by heating a rolled sheet of an aluminum alloy containing 4 per cent copper and 0.5 per cent magnesium to a temperature of some 930° F and quenching, its tensile strength increased to between 35,000 and 40,000 psi. This was considered high strength for aluminum, but four days later Doctor Wilm tested the same piece again and found that its strength had increased to 55,000 psi. Other tests showed that the hardness of the metal also had increased.

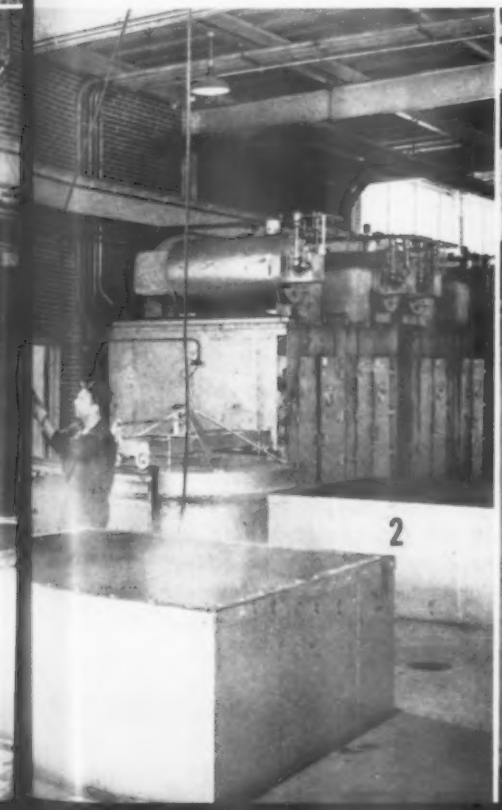
This discovery of Doctor Wilm's started a series of extensive studies into the mechanism of heat treatment of aluminum alloys which even now is by no means completed, although great use is made of these treatments. The mechanical properties of certain aluminum alloys are greatly improved by heat treatment, as discussed in the first article of this series. It is possible, however, to alter not only hardness, strength and ductility, but also electrical and thermal conductivity, dimensional stability, machinability, and other properties as well.

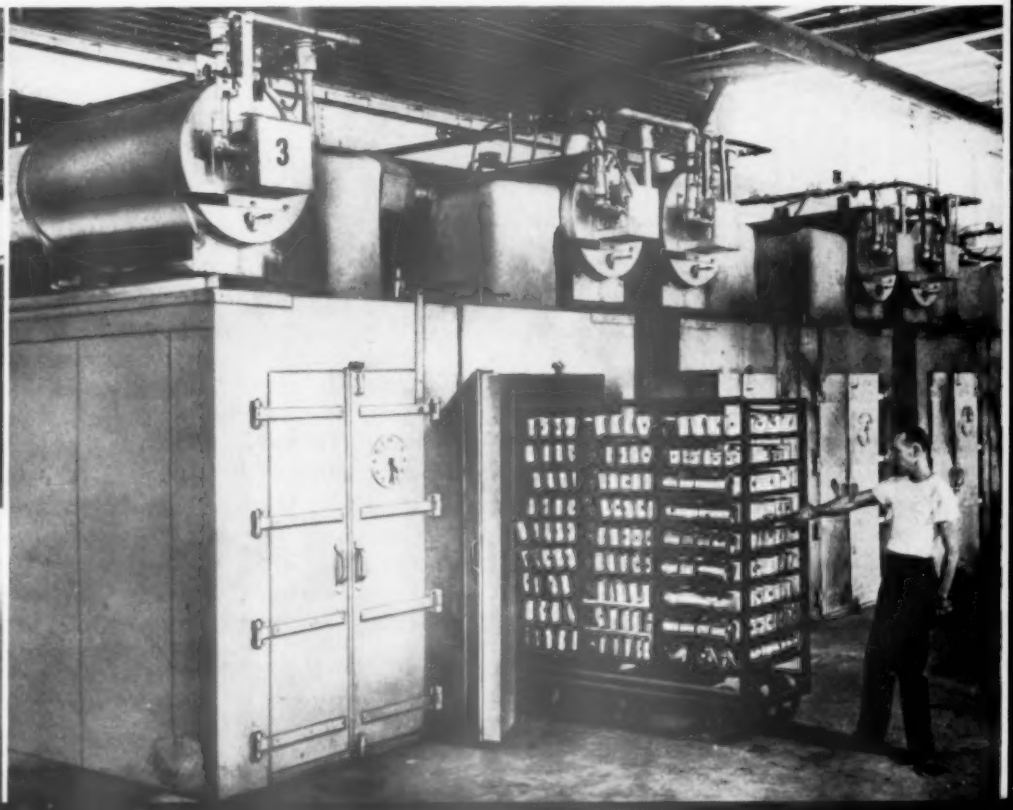
An understanding of present theories concerning the mechanism of heat treatment is facilitated by first considering what happens during the solidification process.

How Aluminum Alloys Solidify—An aluminum alloy does not solidify homogeneously at one specific temperature, but different alloy constituents solidify over a considerable range of temperature. Microscopic examination has shown that a dendritic crystalline structure develops; under the microscope this has the appearance of interlaced evergreen tree branches.[2, 3]

As the molten metal cools and solidification begins, the dendrites, as the tree-like crystals are called, begin to form. The first constituent to solidify contains considerably less of the alloying element or elements than is represented by the average composition of the alloy. As solidification progresses, the dendrites grow, successive layers containing increasing concentrations of the alloying elements. The dendritic structure thus consists of solid solutions of increasing concentration of alloying elements from core to outer layers.

When the lower limit of the solidification temperature range is reached the last constituents solidify, in most alloys in the form of a eutectic, and the temperature at which they solidify is called the eutectic temperature. In addition to solid solutions, the eutectic may contain different constituents—such as elements or intermetallic compounds, so-called because





of their relatively unvarying composition. The eutectic, being the last to solidify, is deposited among the dendrite branches.

The solidified metal thus consists of two fundamental types of material: (1) solid solutions of varying composition; (2) intermetallic compounds of fixed composition. The structure is further complicated by the tendency of some of the alloying elements, and also the "impurities," to form solid solutions and intermetallic compounds between themselves as well as with aluminum.

Properties of both the solid solutions and the intermetallic compounds differ from those of the parent metal. Within the solubility limits of alloying elements in aluminum, increasing concentrations of hardening elements produce alloy of increasing tensile strength and decreasing ductility. Intermetallic compounds usually are hard and brittle. Both classes of constituents impart their characteristics to the alloy to a degree depending on the concentrations present.

From the foregoing explanation, it may easily be seen that in the as-cast condition the hardening elements are not distributed so as to produce optimum characteristics. Heat treatment offers a means of redistributing these elements more uniformly throughout the metal and thus greatly improving its characteristics, provided the alloy contains at least one element having a solid solubility in aluminum much greater at elevated temperatures than at room temperature. Aluminum-copper and aluminum-magnesium alloys are of this type and therefore their properties are subject to marked improvement by heat treatment. In addition, magnesium and silicon form an intermetallic compound, Mg_2Si, which has solubility characteristics similar to those of copper and magnesuim. This compound forms a pseudobinary system with aluminum, and casting alloys of this system are therefore heat treatable.

Types of Heat Treatment—In an early article of this series it was pointed out that three basic types of heat treatment are in common use: (1) artificial aging; (2) solution heat treatment followed by rapid cooling, or quenching; and (3) solution treatment and quenching followed by artificial aging. These three basic treatments may be varied as follows to produce a variety of effects:

1. Artificial aging only:
   a. For hardness, machinability, and dimensional stability.
   b. For stress relief, dimensional stability, and mechanical properties suitable for many applications.
   c. For complete softening or annealing.
   d. Combination of *a* and *b*.
2. Solution heat treatment and quenching, followed by aging at room temperature to a substantially stable condition:
   a. For maximum resistance to corrosion.
   b. For maximum ductility consistent with good strength.
3. Solution heat treatment and quenching, followed by artificial aging:
   a. For good machinability.
   b. For high strength and hardness consistent with intermediate ductility.
   c. For both *a* and *b*, plus stress relief and dimensional stability.

Solution Heat Treatment—As the name implies, solution heat treatment is a treatment of the alloy at elevated temperature to increase the amount of alloying element or elements in solid solution. This is accomplished by heating to a point just below the lower limit of the melting temperature range and holding at that temperature until the desired solution has taken place. Quenching, preferably in water or oil, then will cool the alloy so rapidly that these elements do not have an opportunity to precipitate but are retained in supersaturated solid solution when the alloy returns to room temperature.

TABLE I—Heat Treatments for Commercial Aluminum Casting Alloys

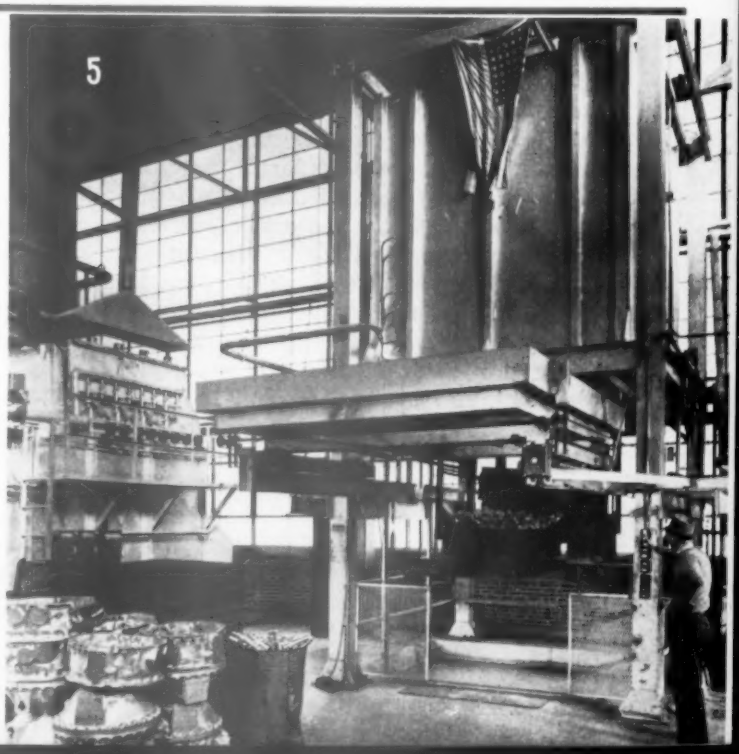
Alloy	Sand or Permanent-Mold-Cast	Type of Treatment	Solution Heat Treatment Time, Hours[1]	Solution Heat Treatment Temperature, Deg F[2]	Solution Heat Treatment Quench[3]	Aging Treatment Time, Hours[4]	Aging Treatment Temperature, Deg F[2]
C1	Sand	Solution	12	960	Water		
C1	Sand	Solution & Aging	12	960	Water	3-5	310
C1	Sand	Solution & Overaging	12	960	Water	12-16	310
CG1	Sand	Annealing				2-4	600
CG1	Sand	Solution & Overaging	12	950	Water	10-12	310
CG1	Perm.	Aging				5-7	310
CG1	Perm.	Overaging				18-22	340
CG1	Perm.	Solution & Aging	8	950	Water	7-9	340
CN21	Sand	Annealing				2-4	650
CN21	Sand	Solution & Stabilizing	6	970	Still Air	1-3	650
CN21	Perm.	Overaging				40-48	340
CN21	Perm.	Solution & Aging	4	960	Water	3-5	400
CS4	Perm.	Solution	8	950	Water		
CS4	Perm.	Solution & Aging	8	950	Water	5-7	310
CS4	Perm.	Solution & Stabilizing	8	950	Water	4-6	500
CS23	Perm.	Aging				5-7	525
CS23	Perm.	Solution & Stabilizing	8	920	Water	2-4	525
SC8	Sand	Solution & Aging	12	940	Water	2-5	310
SC8	Perm.	Solution & Aging	8	940	Water	2-5	310
SC21	Sand	Aging				7-9	440
SC21	Sand	Solution & Aging	12	980	Water	3-5	310
SC21	Sand	Solution & Overaging	12	980	Water	8-10	310
SC21	Sand	Solution & Stabilizing	12	980	Water	4-6	475
SC21	Perm.	Aging				7-9	440
SC21	Perm.	Solution & Aging	8	980	Water	3-5	310
SC21	Perm.	Solution & Overaging	8	980	Water	14-18	340
SC21	Perm.	Solution & Stabilizing	8	980	Water	4-6	475
SC41	Perm.	Aging	8	960	Water	8	390
SC41	Perm.	Solution	8	960	Water		
SC41	Perm.	Solution & Aging	8	960	Water	8-12	300
SC41	Perm.	Solution & Stabiliizng	8	960	Water	8	440
SC42	Sand	Solution	12	980	Water		
SC42	Sand	Solution & Aging	12	980	Water	8-12	300
SC42	Sand	Solution & Stabilizing	12	980	Water	8	440
SC42	Perm.	Aging				8	300
SC42	Perm.	Solution	8	980	Water		
SC42	Perm.	Solution & Aging	8	980	Water	8-12	300
SC42	Perm.	Solution & Stabilizing	8	980	Water	8	440
SG1	Sand	Aging				7-9	440
SG1	Sand	Solution & Aging	12	1000	Water	2-5	310
SG1	Sand	Solution & Stabilizing	12	1000	Water	2-4	475
SG1	Perm.	Solution & Aging	8	1000	Water	3-5	310
SG1	Perm.	Solution & Stabilizing	8	1000	Water	7-9	440
SN41	Perm.	Overaging				14-18	340
SN41	Perm.	Solution & Overaging	8	960	Water	12-16	340

1. Soaking time periods, after load has reached specified temperature, required for average casting. Time can be decreased or may have to be increased depending on particular castings as demonstrated by experience.
2. Temperature setting for control instrument. Variation of temperature in furnace should not exceed plus or minus 5° F.
3. Water temperature from 150 to 212° F can be employed. Boiling water recommended since it minimizes quenching stresses and distortion.
4. Exact time required influenced by foundry variables. Select on basis of obtaining typical hardness values.

Fig. 4—Load of castings entering quench tank after being removed from heat treating furnace

Fig. 5 — Elevator type electric annealing furnace with quench tank below

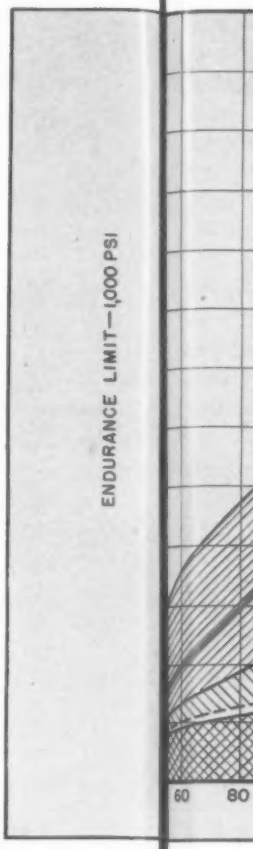
With all aluminum alloys this solid solubility is limited, and complete equilibrium is commercially not attainable because the time required would be prohibitively long. Usually up to 24 hours at elevated temperature is the longest solution time used, and for the majority of sand castings from 8 to 16 hours is sufficient. In chill-cast alloys and permanent mold castings, the higher rate of cooling retains more of the alloying elements in solid solution in the as-cast condition. This, together with the finer grain size resulting from the rapid chill, reduces the solution treatment time of perma- (*Please turn to page* 226)



Influence of fatigue strength on the serviceability of metals is discussed in this second and concluding article dealing with various strength properties of castings. The first article appeared in the July issue

By J. B. CAINE
Metallurgist
Sawbrook Steel Castings Co.
Lockland ,O.

What is Strength?



IT IS to the advantage of the foundryman to talk, think and sell the conception of service strength and service ductility, not standard tensile strength and ductility. If the part is loaded statically, or statically plus sudden dynamic shock loading, the best criteria are yield strength for the evaluation of service strength, notched impact strength for the evaluation of service ductility. Castings and cast metals can compete much better under these conditions than under tensile specifications. However, this is still only part of the evaluation of serviceability, as there is another very important type of stressing in service —repeated stressing for long periods of time. All moving parts are subjected to this type of service stress.

The majority of service failures of metallic parts are due, and are accepted as being due, to fatigue. The metal simply gets tired after being subjected to many million applications of the load, even though in many cases the load is below the yield strength. The fracture on failure is unmistakable, in the simplest cases is a structureless series of rings surrounding a coarse crystalline core. Although strength in fatigue is related somewhat to the tensile strength of the metal, for all practical purposes it is a separate entity. By far the greatest single factor determining fatigue strength is the design and fabrication of the part, to again avoid stress concentration.

This type of service failure is one of stress concentration pure and simple; an infinitesimal amount of metal at the point of failure is stressed to above its fatigue strength and parts, thereby initiating a crack which automatically increases the amount of stress concentration. The crack progresses until the section becomes too small to withstand the load and it breaks under extreme stress concentration, just like it does in sharply notched tension and impact failures. The only difference is one of time. In fatigue the part holds together for a period of time, sometimes measured in years. In brittle static or dynamic failure the part breaks almost immediately after being put into service. In all cases the part breaks brittlely, with no deformation and usually with no warning.

The foundryman should be more interested than ever in this type of stressing and in evaluating the behavior of his castings to this type of service stress, for the metal itself plays only a minor role, since design and fabrication are all-important in determining the fatigue strength of the part. Cast metals should be on a par with metals formed by any other process and there is a possibility that they may excel in some instances. Then too, this type of service strength, or lack of it, is the reason for the majority of service failures.

Nevertheless, it is almost impossible to find comprehensive data on the fatigue strength of cast metals. Those data given in engineering handbooks, the designer's bibles, almost invariably show lower values in fatigue for cast metals than for comparable wrought metals. It is quite probable that the engineers who wrote or compiled these handbooks were unable to find sufficient information on the fatigue strengths of cast metals to be sure their values were correct. To be safe they lowered the known values for wrought metals to fill in the blanks for cast metals, in these cases using a true factor of ignorance.

Although the testing procedure for this important property is well established and accepted, this test can never be used for control because of the time involved. The specimen is loaded repeatedly, either as

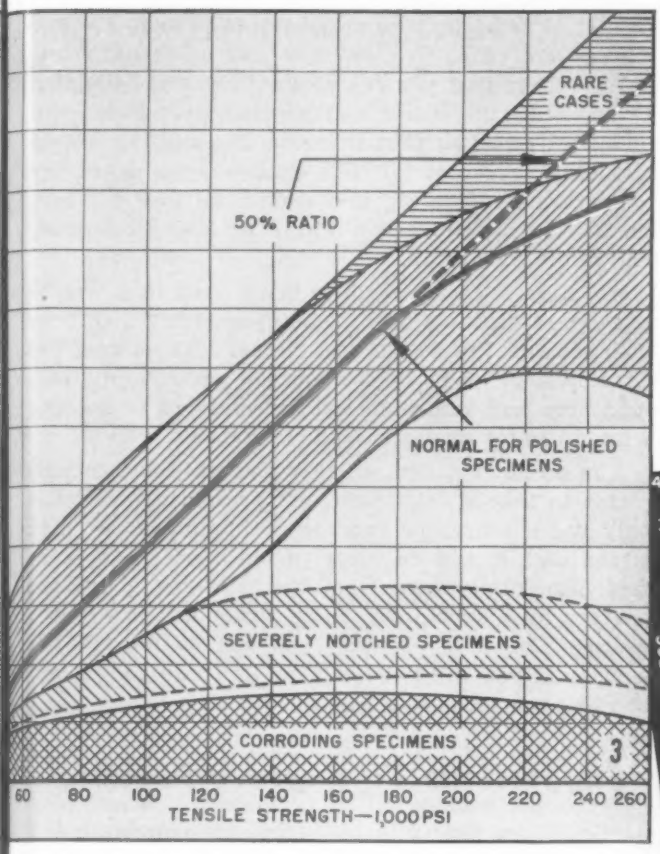


Fig. 3—Behavior in fatigue of wrought steel. (Gillett, "An Engineering Approach to the Selection, Evaluation and Specification of Metallic Materials")

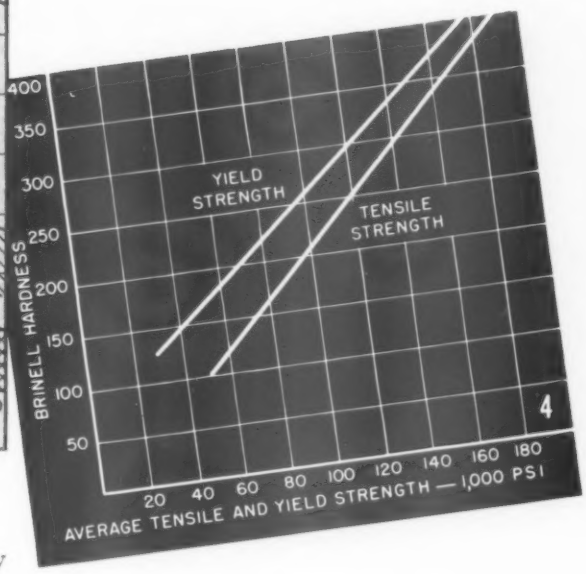


Fig. 4—Relationship between yield strength, tensile strength and brinell hardness of cast steel

a rotating beam, transversly, in tension, or in any other manner, until it fails. Many millions of load applications on a number of specimens are required before the fatigue strength can be determined. The test can only be used in evaluation, but because it is so important in evaluating service strength, any time and money spent testing is worth while. Very little if any fatigue work has been done in the foundry industry. If only a portion of the time now spent on useless repetitive tensile testing in the industry would be spent on fatigue testing, the information obtained on this most important property would be priceless in eliminating the uncertainty the designer must face when he designs for cast construction, in fatigue.

More information is required than on just standard fatigue strength, the property now found in the handbooks the designer uses. Standard fatigue strength is again an ideal property and of not much more use than ideal tensile properties. Stress concentration again is a factor. The standard fatigue strength specimen is of ideal design, the reduced section is not only polished, but polished with the scratches running longitudinally. It is machined with a 9⅞-in. radius. Normal finish, even though ground, and normal radii cannot be used, for the specimen will break prematurely at a shoulder or at a scratch. Stress concentration is all-important in fatigue strength.

What is sorely needed for both cast and wrought metals is information on notched fatigue strength, information even more necessary than knowledge on notched static and impact strength. There is some scattered knowledge on notched fatigue strength of wrought steel, just enough to make the designer and consumer conscious and aware of how dangerous a rough surface or a notch can be. Even this scant knowledge affects the foundrymen, for many of his castings are subject to fatigue, and many times the fatigue stresses are acting on a rough, unmachined, cast surface. How do these surfaces resist fatigue? No one knows; the designer must apply a factor of safety, and in this case a true factor of ignorance and castings suffer competitively.

Just how badly notches and stress concentration lower the fatigue strength of wrought steel is shown in Fig. 3. In this chart the fatigue strength is plotted against the tensile strength. For polished specimens the fatigue strength averages about 50 per cent of the tensile strength up to 180,000 psi, although there is a wide scatter band on both sides of the average line. Note how much the fatigue strength is lowered by what Gillett calls severely notching the specimens. The fatigue strength no longer increases with the tensile strength, and the notch is the controlling factor. This fact should be of prime interest to the iron foundryman, for his metal is not appreciably notch sensitive, statically or dynamically, and has about the same fatigue strength notched or unnotched. Many times a good high strength iron will have a higher notched fatigue strength than a steel with twice its tensile strength and in many cases will outperform the steel in service.

The severely notched specimens plotted in Fig. 3 are in reality no more (*Please turn to page* 166)

Questions AND Answers

Trouble May Be Due to Gassing

Q.—We are sending you a small section of a brass casting made in the 85-5-5-5 alloy. We are having considerable trouble with leakers since most of the castings must resist pressure. You will notice the discoloration in the fracture which we believe is due to use of too much remelt and borings. Can we remedy the situation by adding new metal, and how much should we add?

A.—To determine how much new ingot metal or zinc, lead and tin should be added to remelt and borings to obtain the 85-5-5-5 composition, a chemical analysis will have to be made. However, we suspect that the real culprit is gassy metal or possibly lack of feed. You do not mention whether the borings are free from oil and grease, which often cause trouble in crucible melting. Oil and grease should be removed before the borings are placed in the crucible.

When using large quantities of remelt and borings, it might be advisable to melt and pour into ingots. After analyzing for composition, they could be remelted with suitable tin, lead and zinc additions. Element lost most easily during melting is zinc, which to some degree acts as a degasifier. Hence, you might be able to overcome some of your trouble by addition of say 1 or 2 per cent slab zinc about 5 minutes or so before pulling the pot from the furnace. Plunge some of the zinc to the bottom of the melt—but be sure it is absolutely dry.

Wants To Make White Iron Plates

Q.—We are operating a gray iron foundry, and wish to make some grain grinder plates approximately 10 in. in diam and ¾-in. thick. However, we do not have any experience in white iron production, and would like to know how to make satisfactory plates.

A.—White fracture iron is produced when the composition is such that practically all of the carbon is retained in the combined form. This may be accomplished by reducing the silicon content or adding certain alloying agents or by a combination of both. Since we do not know what materials you have available for melting, we cannot give any data on possible cupola mixtures except to say that considerable steel scrap may be necessary to provide the low silicon iron.

We believe that you can produce the grinder plates by adjusting the amounts of pig iron, gray iron scrap and steel scrap so that the resulting analysis shows about 0.70 per cent Si. For example, you might try a mixture of 75 lb pig iron containing 2.50 per cent Si, 200 lb gray iron scrap containing 2.00 per cent Si, and 725 lb steel scrap.

An alloy mixture which is being used to a widening extent contains 0.80 to 1.00 per cent Si., 0.15 to 0.20 per cent P, 4.50 per cent Ni and 1.50 per cent Cr. Chromium alone or in combination with copper, molybdenum and vanadium also is employed in making white irons for wear and heat resistance.

You do not mention whether you will have enough plates to take a day's heat, but presumably you will only use a charge or two for that purpose. If that is the case it will be wiser to put those charges in first, separating them from the following gray iron charges by a double coke split. That will slow down melting sufficiently so that you can distinguish the point, and you will not put gray iron into the plates, or white iron into other work.

Suggestions To Improve Practice

Q.—We experience cold iron from our cupola on the first two taps. Perhaps one or more of our cupola practices are wrong. Following are the data: Cupola diam 30 in. bricked down from 48 in. normal; bed height 54 in. above top of tuyeres; static wind pressure 12 oz; charge 135 lb coke, 40 lb limestone, 300 lb remelt, 600 lb pig iron, 50 lb silvery pig, and 50 lb steel; analysis 2.3 per cent Si, 3.6 per cent TC, 0.8 per cent Mn, 0.09 per cent S and 0.16 P; metal drip 3 minutes; metal runs 8 minutes; melting rate 3.6 tons per hr; average daily melt 6 tons; bed lighting 3½ hr before wind time; charge soaking time 1 hr. Recently we tried to run 12 in. diam chilled wheels with powdered Cr additions to our regular iron in hand ladles. We used 3 lb 60 to 65 per cent FeCr per 100 lb iron. Analysis showed 0.5 per cent Cr and chill only 1/16-in. We would like to get ¼-in chill. How can we do that?

A.—According to the usual method of calculating melting rate of a cupola as 10 lb per sq in. of area, and from published estimations, your cupola is giving good results. While many use 1000-lb charges in a 30-in. diam cupola, it is claimed that better results are secured with charges about half that size. You seem to be using an extremely high bed for such a small cupola and only 5 per cent steel scrap. However, your reference to running iron in 8 minutes, provided that means a steady continuous stream from the taphole, indicates that it is not too high. The best method we know of to determine the most suitable bed height is to inspect the cupola lining before patching for the next day's heat and observe where the top of the melting zone occurs. That height plus the thickness of a regular coke split (in your case about 11 in.) should be the practical operating height. We have an idea that the 54-in. height of bed was used when the cupola was 48 in. diam, and are sure that you will find a 40 to 46 in. bed will be satisfactory for the present diameter.

With reference to the use of chromium it appears

that the iron was not hot enough to dissolve all the ferrochromium since you added 1.80 to 1.95 per cent and recovered only 0.5 per cent Cr which is extremely wasteful practice. While that amount in the comparatively high silicon iron would change the structure and result in a stronger and tougher iron, it would not necessarily result in chilled edges in green sand. However, when the plain iron is cast against a chill we would expect a slight chill, and that would be increased through the chromium addition.

The only reason we can think of that might be the cause of the lack of chill, is that the silicon was considerably higher than the 2.3 per cent mentioned. Incidentally, the addition of 3 lb of cold FeCr to a 100-lb ladle of iron hardly would be expected to provide complete solution unless the iron was extremely hot. One method to get better recovery would be to bring the ferrochromium to a red heat before addition, although we believe that a more successful procedure would be to use a larger ladle (holding 500 lb for example). The addition would be made to the iron as it runs over the spout into the ladle by means of a hopper with an adjustable feeding gate. The alloyed iron then could be transferred to the smaller pouring ladles. Also we believe that you would have to add only about 1 per cent Cr to your iron to obtain a decided chill.

However, we believe that the most suitable procedure for making the chilled wheels is to melt a special charge in the cupola which will provide the proper base composition. Preferably it should be the first charge with a silicon content around 1 per cent. That could be made by using 400 lb remelt, 500 lb steel scrap and 100 lb pig iron or 500 lb each of remelt and steel scrap. If you do not have sufficient wheels to use 1000 lb, you could use two 500-lb charges; the first low silicon and the second the regular mix.

Another possibility for obtaining chill by alloying is the use of tellurium; probably by using a wash on the chiller rather than making a direct addition to the molten iron. Tellurium is a drastic carbide stabilizer and only extremely small amounts are needed —for example, 1 g per ton will show an effect. With the comparatively small amount of iron involved for the wheels, it would be somewhat difficult to make and control the tellurium additions to provide the desired results.

Sand Properties Need Changing

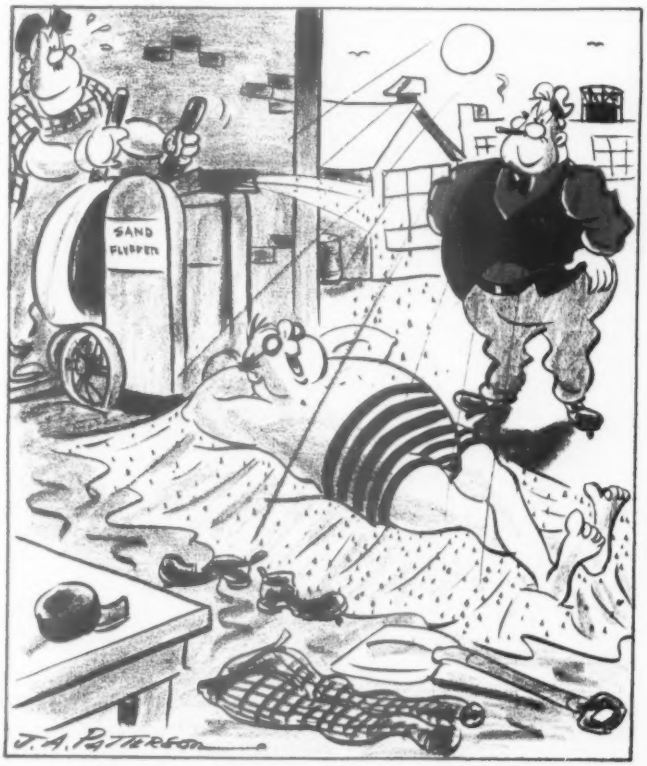
Q.—Our present problems can be broken down into two parts as follows: 1—Sand wash, scabs and blisters. 2—Shrink. In our opinion sand wash may be due to weak sand. Our green strength averages 4 psi. Scabs occur due to our low permeability of 24. Blisters are caused by clay balls or wet sand spots. What is your opinion? Along the subject of sand we would like your recommendations for green sand strength, permeability and moisture for molding 2-lb roller bearing boxes up to 25-lb cast iron car wheels on squeezers using mostly 12 x 1-in. to 14 x 14-in. flasks. Also recommendations on sand needed for floor work covering sheave wheels from 50 lb at 16-in. diam to 1000 lb at 24-in. diam with maximum section of 2½ in. We also have been troubled with internal shrink which occurs inside the casting opposite the gates. We have helped this situation by using shrink bobs. However, our loss of 20 per cent is still high. Whenever possible we put shrink bobs on the outside of the wheels and gate into the bobs.

A.—There is no doubt that your troubles as outlined are due essentially to the low strength and permeability of your molding sand, and your remarks as to the reasons why certain defects appear conform to current opinion. Therefore, it appears that by placing your sand in the proper condition, the troubles should be eliminated. For the squeezer work we suggest that the permeability be around 40 with a green compression strength from 6 to 7.5 psi, and a moisture content of 6 to 7 per cent. For the floor work the sand permeability should be around 100 with a green compression strength from 6 to 8 psi, and the moisture content from 4 to 6.5 per cent. These figures are given as starting points and may have to be adjusted to meet the particular conditions in your foundry. While it may take time and money to develop the proper sands and sand conditions for your various types of castings, results obtained will be well worth the investment.

As far as the internal shrink in the casting opposite the gates is concerned, we believe that the gates are freezing off before the casting is solidified completely. Hence, it will be necessary to open the connecting neck sufficiently to insure adequate feeding. Same results may be secured by forming a hot-spot between casting and sprue by use of a cut-off or neck-down core, or by making the connecting neck as short as possible, or as you do at times, employ a shrink bob close to the casting cavity. Proper gating and risering of castings often requires use of sectioning or fracturing of the parts to determine the effectiveness.

GANGWAY!

By J. A. PATTERSON



"That's what I say—what's Florida or California got on this?"

RICHARD L. TEMPLIN
Newly Elected President

By WILLIAM G. GUDE
Managing Editor
THE FOUNDRY

ASTM Holds 51st Annual Meeting

THE 51st annual meeting of the American Society for Testing Materials, held in Detroit, June 21 to 25, attracted a total registration of nearly 1800 members and visitors to its comprehensive program of more than 135 technical papers and reports, 360 committee meetings and an extensive exhibit of testing and research equipment.

As a result of recommendations by the society's committees, 52 new tentative specifications and tests were approved and about 70 existing tentatives are to be adopted as standard subject to letter ballot during the summer.

At the annual election of officers and directors of the society the following were chosen for 1948-49: President, Richard L. Templin, assistant director of research and chief engineer of tests, Aluminum Co. of America, New Kensington, Pa., succeeding T. A. Boyd, research consultant, Research Laboratories Division, General Motors Corp., Detroit; vice president, L. J. Markwardt, assistant director, U. S. Forest Products Laboratory, Madison, Wis. The latter will serve with the senior vice president, J. G. Morrow, metallurgical engineer, Steel Co. of Canada Ltd., Hamilton, Ont.

New directors to serve three years are: Leslie C. Beard Jr., chemist and assistant director of laboratories, Socony-Vacuum Oil Co. Inc., New York; Simon Collier, director of quality, Johns-Manville Corp., New York; Theodore P. Dresser Jr., chief engineer, Abbot A. Hanks Inc., San Francisco; Howard K. Nason, associate director, central research department, Monsanto Chemical Co., Dayton, O.; Edgar W. Fasig, general superintendent, Lowe Bros. Co., Dayton, O.

As reported by C. L. Warwick, executive secretary, at the opening session, membership in the society has reached an all-time high, exceeding 6400 as of June 1. Mr. Warwick touched briefly on the annual report of the board of directors and indicated that the Detroit gathering marked the culmination of what probably was the most active year in the society's history. During the period the Committee on Standards accepted 32 new tentative standards in addition to 41 revisions of tentatives, and 3 tentatives were withdrawn. Mr. Warwick announced that publication plans of the society call for increasing the number of issues of the *Bulletin* from six annually to eight. He also announced that the 1949 annual meeting of ASTM will be held at Chalfonte-Haddon Hall, Atlantic City, June 27 to July 1. In addition, a national meeting of the society will be held in 1949 at the Fairmont Hotel, San Francisco, Oct. 10 to 14. Committee week and the spring meeting next year will be held at the Edgewater Beach Hotel, Chicago, the week of Feb. 28.

The Charles B. Dudley medal, named after the society's first president and awarded to the author or authors of a paper in the (*Please turn to page* 170)

New...

FOR FASTER, EASIER, LOWER COST FINISHING OF GRAY IRON CASTINGS

'NISILOY'*

(NICKEL-SILICON-ALLOY)

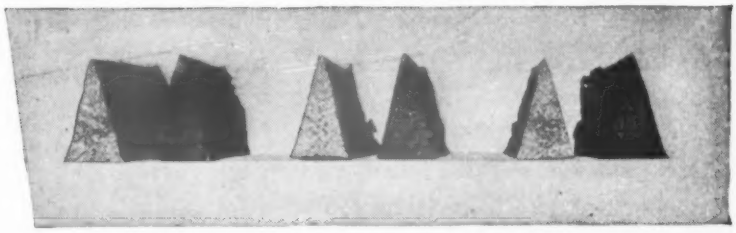
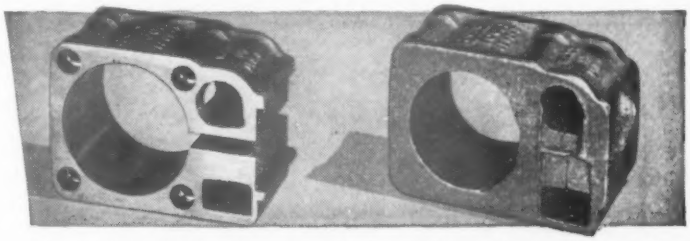


Photo of 1" chill test bars show advantages of Nisiloy. In each pair, wedge on left is white, and was cast without Nisiloy. Right hand wedges used progressively 1 to 1½% Nisiloy. Notice complete elimination of hard white iron on specimen at extreme right.

WHAT IT IS

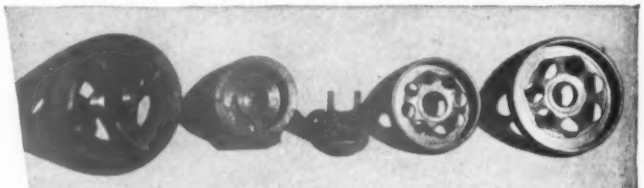
"NISILOY" is an inoculant with positive graphitizing power. It contains about 60% nickel, 30% silicon, balance essentially iron. Its remarkably low melting point of 1800° F. and relatively high specific gravity causes it to dissolve quickly in liquid iron.



Use of 1% Nisiloy in these cylinder castings eliminated machining troubles from hard spots in light sections, raised output, reduced rejects and cut final costs.

WHAT IT DOES

"NISILOY" improves machinability . . . it provides a dense, gray, easy-to-machine structure that reduces machine shop costs.



Nisiloy helps you control properties of gray iron for casting parts with varied cross sections that tend to create chilled surface areas. Its use eliminated machining troubles, and provided a dense, uniform close-grained microstructure in these bonnets, slide valves and bushing.

HOW TO USE IT

"NISILOY" is simply added to the ladle. Additions of from .25 per cent to 1.00 per cent usually prove sufficient for structure control. Improve quality and quantity of your output. Get full information . . . mail the coupon now.

*Trade Mark of The International Nickel Company, Inc.

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Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses and bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC.
Dept. T.F., 67 Wall Street, New York 5, N. Y.

Please send me your booklet entitled, "NISILOY" for GRAY IRON CASTINGS.

Name.....*Title*.....

Company.....

Address.....

City.....*State*.....

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

INDUSTRY Briefs

SYMINGTON-GOULD CORP., 20 Symington Pl., Rochester 11, N. Y., has purchased from War Assets Administration a surplus armor steel casting plant at Depew, N. Y. Symington-Gould, wartime operator of the plant, plans to spend about $75,000 within 18 months in making capital improvements.

* * *

Detroit factory branch of Waltham Grinding Wheel Co., Waltham, Mass., has been moved to 1433 East 8 Mile Road, Hazel Park, Mich. Walter W. Hayden has been named manager. Mr. Hayden has been associated with the grinding wheel industry for 11 years.

* * *

Curry Mfg. Co., 851 East 60th St., Los Angeles, has been incorporated by George R. Dodber, Madge Johnson and D. E. Spears, to engage in the general die casting, foundry, manufacturing and machine shop business. New corporation is represented by James L. Patten, Los Angeles.

* * *

Wayne Foundry Co., 3100 Hubbard Ave., Detroit 10, has changed its name to Wayne Foundry & Stamping Co. The organization remains the same with the following partners: I. E. Goodman, C. E. Todd and Charles D. Todd Jr.

* * *

Combined volume of shipments of ingot brass and bronze as reported by the Ingot Brass Industry, Chicago, was 23,716 tons for May, 25,177 tons for April and 19,525 tons for May, 1947.

* * *

Alabama Pipe Co., 400 West Twentieth St., Anniston, Ala., will spend about $900,000 remodeling its water pipe plant in Anniston. Closed since 1944 because of manpower and raw material shortages during the war, the plant, upon completion of the program, will have a capacity of approximately 200 tons daily. The most modern equipment will be installed, including advanced materials handling and cupola charging. A complete laboratory for chemical, physical and metallurgical testing of raw and finished products also will be included.

* * *

Orefraction Inc., 7500 Thomas Blvd., Pittsburgh, processors of zircon, rutile and other minerals, are completing a two-year expansion program. In the most recent building addition the ground floor will house a ball mill with air classification for milling zircon; the balance of the floor will be devoted to other grinding and milling equipment. The second floor will be used to enlarge the control and research laboratories.

* * *

Dayton Foundry Co., Dayton, Tenn., recently organized, has leased the Dayton Foundry & Stove Works to a new industry which will manufacture gas stoves and heaters. Dayton Foundry & Stove Works was organized in 1947 and capitalized at $100,000. A modern, fireproof plant was erected and machinery installed, but the plant did not get into production.

* * *

Mackintosh-Hemphill Co., Eleventh St., Midland, Pa., established a new safety record of 510 days without a lost time accident—between Dec. 4, 1946, and Apr. 28, 1948. The new record exceeds the previous period of accident-free working by 5 days. Company employees are engaged in working on and around castings weighing from 5 lb to 75 tons.

* * *

Phillips Foundry Co., 2200 "S" St., Bakersfield, Calif., is being geared up for expanded production to manufacture plows for the European aid program. Originally launched as a war industry to manufacture armor plate, the plant was converted to the manufacture of plows for the Dearborn Co., and became the Phillips Foundry Co.

* * *

D & R Engineering Co., Fond du Lac, Wis., has been incorporated by Cyrus D. and Harriet Shabay and Evelyn Thelen, to operate a foundry, machine shop and an engineering and construction business.

* * *

Hewitt-Robins Inc., has moved into new executive and sales offices at 370 Lexington Ave., New York 17. Officers formerly were located at 70 Pine St. The new location also serves as eastern sales offices for the Hewitt Rubber and Restfoam Divisions, Buffalo, and Robins Conveyors and Engineers Divisions located at Passaic, N. J. and New York.

* * *

Midwestern Magnesium, formerly of Garrett, Ind., and closed since V-J Day, has been reopened at Kendallville, Ind., as a division of Kendallville Foundry Inc. Special attention will be given to heat treated sand castings for aircraft and other highly technical parts although a department has been set aside for the production of patterns, coreboxes and driers.

* * *

General Metals Corp., 5701 South Boyle Ave., Los Angeles 11, is building a million-dollar foundry adjoining its present plant for the production of malleable iron castings. All new, modern equipment will be installed, including an electric annealing oven. The new plant will produce between 400 and 500 tons of castings a month.

* * *

Foundry Equipment Manufacturers Association, Cleveland, reports that the index of net orders closed on new foundry equipment was 388.5 for May, 412.0 for April, 326.2 for March and 367.3 for February.

* * *

Bay State Bronze & Aluminum Co., 191 South Main St., East Longmeadow, Mass., has been appointed by Ampco Metal Inc., Milwaukee, as licensee, authorized to produce castings from Ampco Metal ingot.

* * *

Bromen Foundries Inc., has been formed at Milwaukee to conduct a general foundry and machine shop business. Incorporators are Fred Sheldon, Benjamin Mende and James J. Arnold.

* * *

Swartwout Co., Ventilator Division, Cleveland, has appointed George R. Mellema Co., 1211 Plymouth Bldg., Minneapolis, as its representative in that area.

* * *

Badger Die Casting Co., 201 West Oklahoma Ave., Milwaukee, plans one-story foundry additions of brick and concrete blocks, 60 x 60 and 12 x 36 ft.

* * *

Atlas Chain & Mfg. Co., Philadelphia, has appointed H. H. Jarrett & Associates, 223 Peachtree St.,NE, Atlanta, Ga., as southern representatives.

* * *

Link-Belt Co., 307 North Michigan Ave., Chicago 1, plans construction of a modern new plant in the 5100 block of Wayside Dr., Houston, Tex.

THEY'RE TOPS

BAY STATE®

Top Performance Consistently Duplicated . . . an actuality found in all BAY STATE products.

HIGH OR LOW SPEED SNAGGING WHEELS for floor stand, swing frame and portable machines . . . DISC WHEELS . . . MOUNTED POINTS . . . CUT-OFF WHEELS . . . BAYFLEX RAISED HUB DISCS . . . CORE FILES.

Specify BAY STATE for better grinding. On-the-job performance is positive proof. Try them. Literature sent on request.

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WESTBORO, MASS.
Branch Offices and Warehouses
Chicago — Cleveland — Detroit.

Top Performance Consistently Duplicated

Men OF INDUSTRY

ARTHUR W. STOLZENBURG, who has been elected chairman of the Detroit Chapter, AFS, is process and products engineer, Aluminum Co. of America, Detroit. Mr. Stolzenburg was born in Elyria, O., later moving to Cleveland, where he attended public schools and evening classes in metallurgy at Case Institute of Technology. He entered the tool department of Ferro Machine & Foundry Co., Cleveland, in 1914, and was appointed assistant tool supervisor in 1919. In 1923 he joined Aluminum Co. of America as a layout man at the Cleveland foundry. He served as chief inspector of the Buffalo foundry and returned to Cleveland where he spent 5 years in the magnesium foundry. Following a short period with Dow Chemical Co., Midland, Mich., engaged in experimental magnesium foundry work, he was appointed chief inspector in the permanent mold plant of Aluminum Co. of America, Detroit, in 1936, where he has served subsequently as general foreman, assistant superintendent, and process and products engineer. Mr. Stolzenburg has been an active member of the Detroit Chapter and served as its vice chairman last year.

♦ ♦ ♦

Raymond Willey has retired as president of Harbison-Walker Refractories Co., Pittsburgh, and has been succeeded by **Earl A. Garber,** formerly vice president and general manager. Mr. Willey became associated with the company in 1901, as assistant to the supervisor of magnesite purchases in Budapest, Hungary, where he had been engaged as vice consul with the United States consular service. After completion of the magnesite purchases he returned to this country and served the company in various capacities. In 1913 he was appointed assistant to the vice president in charge of operations in Pittsburgh, was elected a director in 1917, and became vice president in charge of operations in 1929. He has been president since 1939. Mr. Garber joined Harbison-Walker in 1915 at the Harwalk, O., plant. In 1944 he became vice president of Northwest Magnesite Co., a subsidiary, and general manager of company plants at Chewelah, Wash., and Cape May, N. J. In 1947 he was elected vice president and general manager of Harbison-Walker and of Louthan Mfg. Co., East Liverpool, O., which was acquired that year. Mr. Garber also becomes president of its subsidiary companies, Northwest Magnesite Co. and Louthan Mfg. Co.

♦ ♦ ♦

Clement J. Freund, dean of the college of engineering, University of Detroit, has been elected president of the American Society for Engineering Education. Dean Freund was graduated from Campion College in 1916 and received a degree in mechanical engineering from Marquette University in 1922. He spent the following 10 years at Falk Corp., Milwaukee, where he served in various positions in the foundry, becoming apprentice supervisor in 1925. In 1932 he was appointed dean of engineering at University of Detroit. An active member of the American Foundrymen's Society, he has been a leader in its apprentice training movement and has written numerous articles dealing with apprentice training work.

♦ ♦ ♦

J. P. Lentz, foundry metallurgist for the International Harvester Co.'s truck engine works, Indianapolis, has been appointed foundry superintendent. He succeeds **A. W. Anderson,** who has resigned to enter private business. Mr. Lentz, a native of Terre Haute, Ind., joined International Harvester Co. in 1936, serving at the tractor works in Chicago and the Farmall works in Rock Island, Ill., prior to joining the Indianapolis division as metallurgist in 1939. He is a former chairman of Central Indiana Chapter, AFS.

♦ ♦ ♦

John T. Llewellyn II has been elected president, Chicago Malleable Castings Co., Chicago. **Leon J. Wise** has been named vice president and a director and **Leonard F. Hartwig,** director.

♦ ♦ ♦

R. E. Peterson, formerly associated with Fansteel Metallurgical Corp., North Chicago, Ill., has been appointed to supervise the x-ray diffraction laboratory of the new aluminum research department, Permanente Metals Corp., adjacent to the Trentwood rolling mill near Spokane. The laboratory will conduct a study of the internal structure of new and existing aluminum alloys. In addition to several years of industrial research, Mr.

(*Continued on page* 110)

A. W. STOLZENBURG

EARL A. GARBER

RAYMOND WILLEY

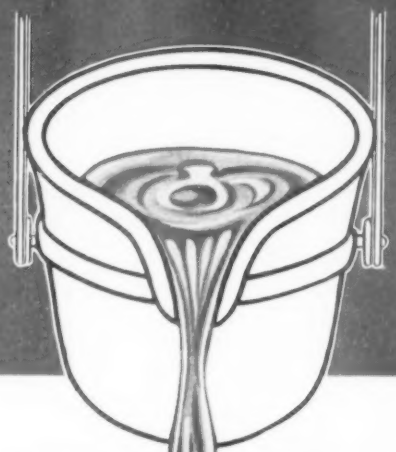
CLEMENT J. FREUND

Our Own Source of Coal

Our Own Source of Ore

Our Own Coking Plant

Our Own Control of Operations



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WOODWARD, ALABAMA

Independent Since 1883

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(*Continued from page* 108)

Peterson was in charge of various research projects for the government at the Watertown and Rock Island arsenals.

♦ ♦ ♦

Carroll B. Dick, recently elected president of the Pittsburgh Foundrymen's Association for 1948-49, is manager of the Feeder Division, Westinghouse Electric Corp., Pittsburgh. Mr. Dick was associated with Studebaker Corp., South Bend, Ind., and American Smelting & Refining Co., New York, prior to 1918, when he entered the forge shop of Westinghouse Electric Corp., East Pittsburgh. Later he became foreman and assistant superintendent of the Motor Division. In 1945 he was appointed manager of the Feeder Division which includes the iron foundry at Trafford, Pa., and the nonferrous foundry at Linhart, Pa. An active member of the Pittsburgh Foundrymen's Association, he served as its vice president last year. He is also a member of the American Foundrymen's Society.

♦ ♦ ♦

R. Grant Eddinger has been appointed foundry superintendent, W. A. Jones Foundry & Machine Co., Chicago. Mr. Eddinger was formerly with the Norris Industries, Columbus, as superintendent of the Miller Foundry Co. there. Prior to that he was associated with Kenton Foundries Inc., Kenton, O., and Wilmot Engineering Co., White Haven, Pa.

♦ ♦ ♦

George C. Schreiber of the sales engineering department of the Claude B. Schneible Co., Detroit, has been placed in charge of the northern Illinois and Wisconsin territories, with headquarters in Chicago.

♦ ♦ ♦

Gilfry Ward has been appointed vice president of the Kellogg Division, American Brake Shoe Co., New York. Mr. Ward attended Yale University and following graduation in 1928, joined American Brake Shoe Co. In additon to his new duties he will continue to serve as vice president of the company's American Manganese Steel Division, a position which he has held since 1938, with headquarters in Oakland, Calif.

♦ ♦ ♦

W. W. Westler, assistant superintendent of the Meehanite foundry of Ross-Meehan Foundries, Chattanooga, Tenn., has been appointed general superintendent. Mr. Westler joined the company in 1943, following 6 years at Cooper-Bessemer Corp., Mt. Vernon, O., where he was foundry cost engineer and assistant superintendent. Previous connections include Niagara Tool Works, Buffalo, J. B. Foote Foundry Co. and F. B. Zieg Mfg. Co., both of Fredericktown, O.

♦ ♦ ♦

Walter P. Barrett has been appointed manager of the New York district office, Dravo Corp., Pittsburgh. Mr. Barrett was graduated from Drexel Institute of Technology and joined Dravo Corp. 13 years ago. Prior to his new appointment he was assistant manager of the Machinery Division district office in Philadelphia. During World War II he served as a captain in the Army.

♦ ♦ ♦

Russell C. Fancher, until recently associated with Eaton Chemical & Dyestuff Co., Detroit, has been appointed sales representative in the Detroit area for U. S. Stoneware Co., Akron, O. Mr. Fancher's headquarters will be in the new office recently opened in Detroit.

♦ ♦ ♦

Grant J. Casserly has been appointed to head the machine service department, the Allison Co., Bridgeport, Conn., manufacturer of abrasive cutting wheels. Mr. Casserly will supervise installation of new abrasive cut-off machines, and service machines already in operation. **Harold R. Powell** has been transferred from the research laboratory to the sales department to assist **H. Robert Powell,** vice president and sales manager. **Edward C. Scanlon,** formerly field engineer in northern New York, has been transferred to the New Jersey territory.

♦ ♦ ♦

John H. May Sr. is president, and his son, **J. D. May,** vice president, of Twin States Foundry & Machine Works Inc., Fairforest, S. C., which they acquired recently. **Claude E. May** is secretary-treasurer. The foundry specializes in gray iron, aluminum, brass and bronze castings, and matchplates for patterns. John H. May Sr., who has been in the foundry industry for over 43 years, was previously associated with the Carolina Foundry, and Standard Iron Works, Spartanburg, S. C.

♦ ♦ ♦

Robert W. Wolcott has gone to Germany at the request of Secretary of Commerce Charles Sawyer, to expedite return of scrap from Germany to the United States. Mr. Wolcott is chairman of the Committee on Iron and Steel Scrap of American Iron and Steel Institute, and the Steel, Foundry and Scrap Industries' Committee for Expediting Iron and Steel Scrap.

♦ ♦ ♦

Ralph S. Poulsen of Lindberg Engineering Co., Chicago, manufacturer of heat treating and melting furnaces, has been appointed district sales manager for the Ohio territory, with headquarters in Cleveland. Mr. Poulsen joined the company 8 years ago and after a training period in the factory entered the Chicago office sales department, later becom-

(*Continued on page* 114)

CARROLL B. DICK

R. GRANT EDDINGER

GEORGE C. SCHREIBER

GILFRY WARD

NO HEAT TREATMENT NEEDED

With

FRONTIER ALLOY "40-E"

THE OUTSTANDING HIGH STRENGTH ALUMINUM *Alloy*

The ALLOY *that has* ALL 6

1. **Shock Resistance**—Tests have proved its exceptional ability to withstand explosive shock and standard impact shock.
2. **Corrosion Resistance**—Excellent, not only in standard corrosion tests but also under stress.
3. **High Yield Strength**—A dominant factor where distortion or misalignment of parts would make the assembly inoperable.
4. **Machineability**—Far superior to the usual sand cast aluminum alloys and machined parts have a high lustre.
5. **Pressure Tightness**—The fine grain of the alloy enables it to withstand high pressures.
6. **No Heat Treatment**—Physical properties are obtained by natural aging at room temperatures.

ENGINEERING DATA ON REQUEST

The Frontier Alloy Data Book brings pertinent engineering and metallurgical facts on the physical properties of "40-E". In writing for your free copy, please state company name, your title, and address.

Licensing franchises now available in certain areas to meet the increasing demand for Frontier "40-E" Alloy. Details on request.

Specifications — Army-Navy Aeronautical Spec. AN-A-17; U. S. Navy Bureau of Ships Spec. 46A-1 (INT), Class 1; A. S. T. M. Spec. B26-42T, Alloy ZG-41, S. A. E. 310.

Typical Physical Properties — tensile strength, 35,000 psi.; yield strength, 25,000 psi.; elongation, 5% in 2".

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Most AUTOMOTIVE MANUFACTURERS *Wheelabrate* for LOWER UNIT COSTS

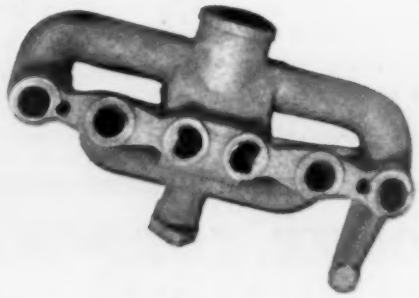
In the highly competitive automotive industry—where high volume production necessitates fast cleaning . . . where unit costs are watched with closest scrutiny—you will find Airless Wheelabrator Blast Cleaning equipment the choice by a wide margin.

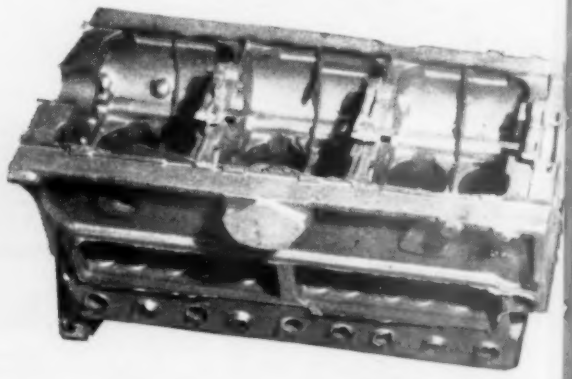
Acceptance like this doesn't happen by chance . . . it is the reflection of outstanding performance, because equipment like this is bought on the basis of comparative tests for faster production . . . better cleaning quality . . . lower production costs . . . economy of operation and maintenance . . . faster return of the investment.

Examples of how the Wheelabrator has attained its position of leadership are shown at the right. Let us show you how similar results can be obtained for you.

TYPICAL AUTOMOTIVE USERS

	No. of Machines
Auto Specialties Mfg. Co.	11
Bendix Aviation Corp.	16
Borg-Warner Corp.	34
Campbell, Wyant & Cannon	14
Caterpillar Tractor Co.	6
Chrysler Corp.	46
Continental Motors Corp.	4
Electric Auto-Lite Co.	8
Ford Motor Co.	101
General Motors Corp.	209
International Harvester Co.	79
Kelsey-Hayes Wheel Co.	12
Mack Mfg. Corp.	5
Nash Motor Div.	5
National Malleable & Steel Cstgs.	33
Studebaker Corp.	9
Thompson Products, Inc.	27
West Michigan Steel Foundry	3





WORLD'S LARGEST BUILDERS OF AIRLES

FASTER PRODUCTION • MORE PERFECT CLEANING

2½ Hour Cleaning Job Now Done in 20 Minutes!

John Deere Tractor Co., Waterloo, Iowa, uses a 48" x 42" Wheelabrator Tumblast (17½ cu. ft. capacity) for cleaning various types of heat treated forgings such as gear blanks, piston rods, etc. Cleaning time averages between 10 and 20 minutes per load, depending upon the form of the forging. The former method used for cleaning these forgings consisted of tumbling them for an hour and a half and then recleaning them on an airblast table for another hour.

180 Cylinder Blocks Cleaned Hourly

The American Foundry Co., Indianapolis, Ind., uses a Wheelabrator Cabinet, with three Wheelabrator units, for cleaning 180 cylinder blocks hourly. With their tumbling and airblast cleaning method, forty-five laborers were required for all cleaning operations. A labor force of only 31 men is now utilized in the cleaning room.

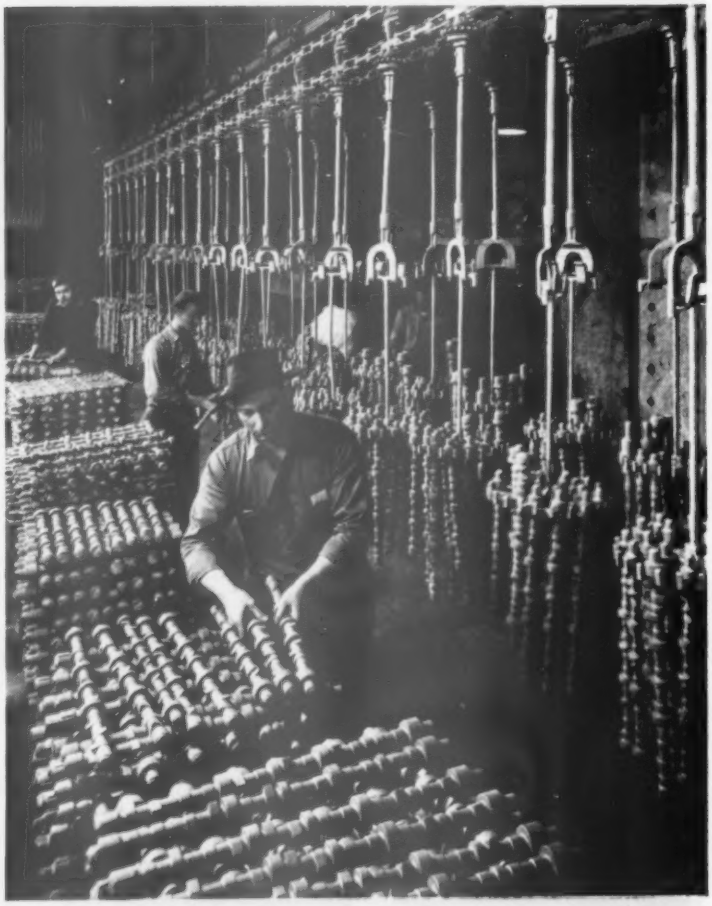
Half Hour Cleaning Time Cut to 5 Minutes!

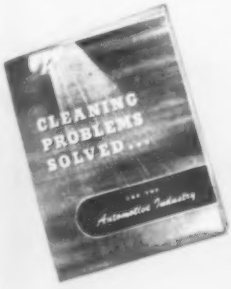
Prior to the installation of a 48" x 42" Wheelabrator Tumblast (17½ cu. ft. capacity) the Unit Drop Forge, Div. of Fuller Mfg. Company, Milwaukee, Wisconsin, used a combination of tumbling and pickling, both of which took about two hours to clean 2,000 connecting rods. The Wheelabrator now cleans 500 in five minutes' time and they are currently cleaning 3,000 per hour.

Production Increased 8 Times!

A No. 1 Wheelabrator Multi Table installed at Mechanics Universal Joint Co., Rockford, Ill., is doing a splendid job of cleaning bearing caps and spiders.

The work now cleaned by Wheelabrating in one hour formerly took 8 hours to do in a Suction Blast Cabinet.





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(FORMERLY AMERICAN FOUNDRY EQUIPMENT CO.)
505 S. Byrkit St., Mishawaka 2, Indiana

BLAST EQUIPMENT

(*Continued from page* 110)
ing assistant sales manager in Indianapolis. He has returned to Lindberg Engineering Co. following a year and a half with an advertising company in the East.

♦ ♦ ♦

Francis W. Sheppard, formerly general sales manager, Harbison-Walker Refractories Co., Pittsburgh, has been elected vice president in charge of sales, Woodward Iron Co., Woodward, Ala., succeeding **John B. DeWolf,** who has retired. Mr. Sheppard was graduated from Citadel Military College, Charleston, S. C., and had been associated with Harbison-Walker Refractories Co. for the last 26 years.

♦ ♦ ♦

Lowell D. Ryan has been appointed managing director of the Malleable Founders' Society, Cleveland. Mr. Ryan attended the University of Illinois and Lincoln College of Law and engaged in the practice of law and newspaper work in Springfield, Ill., until 1942, when he joined the Federal Bureau of Investigation. He had been manager of the legislative department of the Illinois State Chamber of Commerce since October, 1944.

♦ ♦ ♦

John T. Ryan Jr. has been elected executive vice president, Mine Safety Appliances Co., Pittsburgh. Mr. Ryan joined the company in 1936, following graduation from Pennsylvania State College and Harvard Graduate School of Business Administration. He has held successively the positions of sales engineer, assistant general manager and general manager.

♦ ♦ ♦

Dr. Blake M. Loring, recently elected chairman of the Chesapeake Chapter of the American Foundrymen's Society, is senior metallurgist at the U. S. Naval Research Laboratory, Washington. Dr. Loring was graduated from Massachusetts Institute of Technology in 1937, where he remained for 3 years as a research assistant and taught x-ray metallography and heat treatment of steel. In 1940 he received his doctorate in metallurgy from M.I.T. and entered the U. S. Naval Research Laboratory as a metallurgist. His field of work there has included alloy steels and titanium alloys, light metals and copper base alloys. In addition he teaches courses in advanced physical metallurgy. Dr. Loring is chairman of the research committee of the Brass and Bronze Division of the AFS and was awarded the Meritorious Civilian Award for his research in metallurgy during World War II. He served as vice chairman of the Chesapeake Chapter last year.

♦ ♦ ♦

Carl Erickson has been made president and general manager of the National Iron Co., Duluth, Minn., succeeding **William C. Hanson,** who has retired. **Lewis C. Erickson** has been appointed vice president and chief engineer of the company, succeeding **Hjalmer Hallgren,** retired. Other appointments include **Lester E. Erickson,** vice president and general superintendent, and **Charles Eisenberg,** secretary and treasurer.

♦ ♦ ♦

J. C. H. Stearns has been appointed manager of ingot sales, **G. W. DeKuiper,** manager of wrought product sales, and **T. H. Caldwell Jr.,** manager of die castings sales, Magnesium Division, Dow Chemical Co., Midland, Mich. Mr. Stearns was graduated from George Washington University and has spent the last 11 years with the company. Mr. DeKuiper, a graduate of Michigan State College, has worked in the New York, Washington and Midland offices of the company and more recently was magnesium sales manager in Los Angeles. Mr. Caldwell, also a Michigan State College graduate, has been associated with the company for over 8 years in the Midland and Cleveland offices. **E. H. Killheffer,** formerly Boston territory magnesium sales manager, has been appointed manager for the eastern area, with headquarters in New York. **J. C. Mathes,** former director of technical service, has been appointed western sales manager for the division, and **Dr. J. C. McDonald,** who has been assistant director of the technical department, has assumed responsibility for that department.

♦ ♦ ♦

James J. Ewens has been elected vice president in charge of industrial and personnel relations for all foundry divisions of Grede Foundries Inc., Milwaukee. Mr. Ewens attended University of Wisconsin and Marquette University Law School. He joined the staff of the Grede Steel Division, Milwaukee, in 1934, and has been works manager of the Milwaukee Steel and Smith Steel Divisions of the company for the last 11 years.

♦ ♦ ♦

Foye P. Hutchinson has been elected president, Harrington & King Perforating Co., Chicago, succeeding **J. M. Fuller** who has retired following 62 years of service with the company. Other elections include **Judson E. Fuller,** vice president-treasurer, and **S. Harrington Jr.,** secretary.

♦ ♦ ♦

Harlan T. Pierpont Jr. has been appointed sales manager of the Refractories Division, Norton Co., Worcester, Mass., succeeding **Robert Kirkpatrick,** who has retired following 29 years of service with the company. **Norman V. Crabtree** succeeds Mr.

(*Concluded on page* 116)

FRANCIS W. SHEPPARD

LOWELL D. RYAN

JOHN T. RYAN JR.

DR. BLAKE M. LORING

Your NEEDS SERVED BY Electro

ELECTRO HIGH-SPEED GRINDING WHEELS are again in stock in Buffalo and Los Angeles in standard and many special types for installation in both floor and portable machines, and every wheel is engineered to the job.

ELECTRO TERCOD CRUCIBLES for faster melting and faster, safer load-handling, enjoy ever increasing popularity as they speed production and increase profits because of their uniform, Carbon Bonded, Silicon Carbide construction.

INDUSTRIES SERVED

Automotive (*trucks, autos, tractors, airplanes*); Ceramic; Chemical; Construction; Food; Mining; Railroads; Sewage Disposal Plants; Shipbuilding; Water Works; Utilities; Governments (*Federal, State, Municipal, Navy Yards and Arsenals*)

GENERAL PRODUCTS

(1) Abrasive Wheels, *resin-bonded, high-speed;* (2) Refractories; (3) CEMENTS, *high-temperature;* (4) Alloys; (5) Stopper Heads; (6) Furnace Covers and Linings.

for FERROUS FOUNDRIES

(*Steel, Malleable, Cast-Iron*) Stopper Heads; Grinding Wheels, *high-speed;* CEMENTS

for NON-FERROUS FOUNDRIES

Additive Alloys; CEMENTS; Grinding Wheels; Furnace Covers and Linings; Crucible and Pedestal Blocks.

for STEEL MILLS & SMELTERS

Grinding Wheels; Stopper Heads; Brick; CEMENTS; Furnace Covers and Linings; Crucibles and Pedestal Blocks.

for HEAT TREATING AND ANNEALING

MUFFLES, box type; CEMENTS; Hearth Tile; Muffle Tile.

for BRASS ROLLING MILLS

Door Assemblies; Furnace Covers and Linings; CEMENTS; Grinding Wheels; Crucibles and Pedestal Blocks.

for CERAMIC INDUSTRIES

Kiln Furniture; CEMENTS; *high-speed* Grinding Wheels; Muffle Parts; Plate Setters; Posts; Slabs; Tubes—*Rigid, Floating or Combination Construction.*

QUALIFIED FIELD ENGINEERS are always available for job-side co-operation in helping to solve your problems.

We invite inquiries from industrialists who can profit from the use of Electro's efficiently engineered and sturdily constructed products in the wide range indicated above. We shall be glad to send you information folders on any products in which you have special interest.

Electro Refractories & Alloys Corporation

344 DELAWARE AVE. — *West Coast Warehouse* LOS ANGELES — BUFFALO 2, N. Y.

Patent Applied for

(*Concluded from page* 114)

Pierpont as abrasive engineer for the company in Michigan, and **Richard H. Merchant,** formerly field engineer in Detroit, takes over Mr. Crabtree's former Michigan territory. **Murner E. Thor** has been appointed refractories engineer for the division, with headquarters in Worcester, covering the Canadian and New England territories formerly handled by **E. A. Fischer,** who has been appointed a sales engineer in the refractories sales engineering department.

♦ ♦ ♦

Frank W. Shipley, elected chairman of the Central Illinois Chapter of the American Foundrymen's Society for 1948-49, is factory manager of the Foundry Division, Caterpillar Tractor Co., Peoria, Ill. Mr. Shipley was born in Disko, Ind., received his early education in Rochester, Ind., and was graduated from Purdue University in 1921 with a degree in chemical engineering. He was associated with the Studebaker Corp., South Bend, Ind., for 4 years, and subsequently became foundry metallurgist at Lakey Foundry & Machine Co., Muskegon, Mich., and at Fairbanks, Morse & Co., Beloit, Wis. He joined Caterpillar Tractor Co. in 1929, and has served as foundry metallurgist, general superintendent, and factory manager since 1944. Mr. Shipley was vice chairman of the Central Illinois Chapter last year.

♦ ♦ ♦

Alexander C. Andrew, who has been elected chairman of the Eastern New York Chapter of the American Foundrymen's Society for 1948-49, is foundry foreman, American Locomotive Co., Schenectady, N. Y. Mr. Andrew was born in Newark, N. J., of a family associated with the foundry industry for three generations. He received his education in the schools of Newark and Schenectady, N. Y., and recently completed a course in foremanship and supervision at Rensselaer Polytechnic Institute. Following a year in the machine shops at General Electric Co., Schenectady, he entered the American Locomotive Co. pattern shop there in 1925, and has spent the last 22 years in the foundry where he has worked as molder, assistant foreman, and foreman since 1942. Mr. Andrew was active in the organization of the Eastern New York Chapter and served as its first vice chairman last year.

♦ ♦ ♦

George W. Altman, until recently foundry manager, Lennox Furnace Co., Columbus, O., has been appointed general manager, Bridgman Castings Inc., Bridgman, Mich., subsidiary of the Hannifin Corp., Chicago. Mr. Altman was graduated from Carnegie Institute of Technology. During service with the Army Engineers in the recent war he operated a foundry in England, and later in Aachen, Germany. Prior to military service he was a foundry engineer, Pittsburgh Coke & Iron Co., Neville Island, Pa.

♦ ♦ ♦

Horace G. Stults has been appointed representative of the Shanafelt Mfg. Co., Canton, O., for the sale of its line of products in eastern Pennsylvania, Maryland and sections of New Jersey. Mr. Stults has been serving the foundry trade in that section for over twenty years and maintains headquarters in Upper Darby and York, Pa.

♦ ♦ ♦

Walter Geist, president, Allis-Chalmers Mfg. Co., Milwaukee, has been awarded an honorary doctor of engineering degree by the Michigan College of Mining and Technology, Houghton, Mich. Mr. Geist is a trustee of St. Olaf College, Northfield, Minn., a member of the board of governors, Marquette University, Milwaukee, and an associate of Northwestern University, Chicago. He also holds an honorary doctor of law degree from Lawrence College.

♦ ♦ ♦

M. D. Yatsko has been elected president of Terre Haute Malleable & Mfg. Corp., Terre Haute, Ind. **H. L. Arnold** is chairman of the board of directors. Other officers recently elected include: **R. L. Donovan,** vice president and treasurer; **J. T. Sabla,** vice president in charge of sales and production; **Mabel Arnett,** secretary; **F. R. Simmons,** assistant treasurer; and **P. W. Lucas,** assistant secretary.

♦ ♦ ♦

C. Porter Packard has been appointed district manager of the Boston office territory, Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., division of Joshua Hendy Corp., Sunnyvale, Calif. Mr. Packard was associated with the general industry section of the Industrial Division, Westinghouse Electric Corp., Pittsburgh, since 1938.

♦ ♦ ♦

R. V. Schageman has been appointed Chicago district sales manager, McConway & Torley Corp., Pittsburgh, succeeding the late J. J. Hughes, with whom he had been associated for more than 25 years as a sales representative in the midwestern area. Mr. Schageman's headquarters will continue at the Chicago office.

♦ ♦ ♦

Edgar A. Wilcox, E. A. Wilcox Co., San Francisco, has been chosen president of the recently formed Manufacturers' Agents National Association. Mr. Wilcox has been engaged on the West coast for the last 27 years as an electrical and industrial engineer and manufacturers' agent.

FRANK W. SHIPLEY

ALEXANDER C. ANDREW

GEORGE W. ALTMAN

HORACE G. STULTS

VOLCLAY BENTONITE

NEWS LETTER No.22

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE

NON-FERROUS

Bentonite in the Non-Ferrous Foundry

Since most non-ferrous foundries use natural bonded sands, or semi-synthetic mixtures, the following comments are offered:

Most naturally bonded sands have low durability and become weak after several castings. They must be built-up in strength without sacrificing important physical properties. To do this with new sand is expensive, as little pure clay is added.

Weak sands cause cuts, washes, drops, swells, sand inclusions, etc., by adding a little bentonite daily at the muller, on the top of each mold before shakeout, or over the floor, weak sands can be guarded against.

Burned clay of any kind is detrimental to molding sand. Heap sands renewed with Volclay Bentonite accumulates less burned clay and furnishes more live clay.

Panther Creek Bentonite always furnishes good green strength with low hot and dry strength and seems to blend better with natural sands.

Either bentonite is at your service and remember, "a little goes a long way."

AMERICAN COLLOID COMPANY

363 WEST SUPERIOR STREET • CHICAGO 10, ILLINOIS

Producers of Volclay and Panther Creek Bentonite

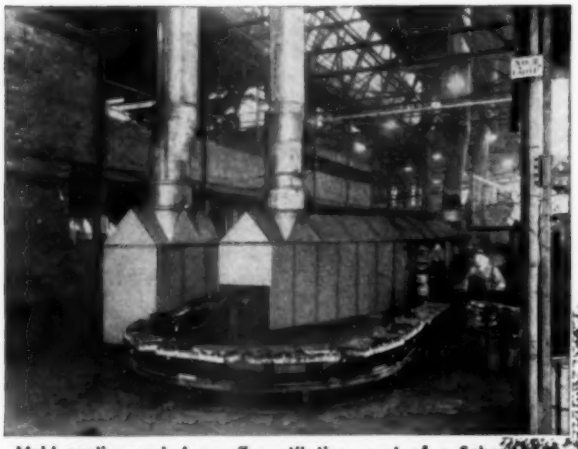
Exhaust Hoods a Capital Investment?

Many foundry men now consider this so. They are as much a part of the foundry equipment as the mold conveyor system, shakeouts, core knockouts and pouring conveyors and the other equipment serving these operations.

Properly engineered, constructed of heavy gage steel on I-beam and channel frames, they are built to serve year after year with little or no attention, as good foundry equipment should. They are not sheet metal canopies built by "the little shop around the corner".

Schneible exhaust hoods and dust collector systems pay dividends too. They reduce dust and smoke, which eats out bearings and motors, coats windows, skylights and walls. They make a better place for your men to work reducing accidents and labor turnover. Send for Bulletins 47 and 548 which show installations in many leading foundries.

Schneible Uni-Flo hoods ventilate this pouring system in a large automotive foundry. Hoods have adjustable louvers to control drift currents. Photographed during normal pouring, notice absence of escaping smoke and fumes.



Mold cooling and dump-off ventilation, part of a Schneible system on snap flask work in a malleable iron foundry.

Core shakeout equipped with Schneible Uni-Flo hood in cylinder block mold unit. Note how oil fumes and dust enter the hood.

MANUFACTURERS ASSOCIATION INC. FOUNDRY EQUIPMENT

CLAUDE B. SCHNEIBLE CO.
2827 Twenty-fifth St., Detroit 16, Michigan
Engineering Representatives in Principal Cities

LIQUID-VAPOR INTIMATE CONTACT EQUIPMENT for DUST COLLECTION ABSORPTION CONDENSATION AND TEMPERATURE REDUCTION

SCHNEIBLE

Officers and Trustees of Foundry Educational Foundation

RICHARD W. CRANNELL

GEORGE K. DREHER

CHARLES A. BARNETT

PETER E. RENTSCHLER

FOUNDRY executives pictured here comprise officers and trustees of the Foundry Educational Foundation. As reported in THE FOUNDRY for July, newly elected officers are: Chairman, Anthony Haswell, president, Dayton Malleable Iron Co., Dayton, O.; president, Peter E. Rentschler, president, Hamilton Foundry & Machine Co.; vice president, Richard W. Crannell, vice president, Lehigh Foundries Inc., Easton, Pa.; secretary-treasurer, Charles A. Barnett, Foundry Equipment Co., Cleveland; executive director, George K. Dreher, Foundry Educational Foundation.

Trustees, in addition to the officers, include: John M. Price, president, Ferro Machine & Foundry Inc., Cleveland; Stowell Wasson, vice president, National Malleable & Steel Castings Co., Chicago; Fred G. Sefing, research metallurgist, International Nickel Co., New York; Bruce L. Simpson, president, National Engineering Co., Chicago; J. H. Smith, general manager, Central Foundry Division, General Motors Corp.; George F. Hutchins II, treasurer, Standard Foundry Co., Worcester, Mass.; B. D. Claffey, executive vice president, Acme Aluminum Alloys Inc., Dayton, O.; C. R. Culling, president, Carondelet Foundry Co., St. Louis; Brinton Welser, vice president, Chain Belt Co., Milwaukee.

JOHN M. PRICE

F. G. SEFING

BRUCE L. SIMPSON

STOWELL WASSON

B. D. CLAFFEY

JAMES H. SMITH

C. R. CULLING

BRINTON WELSER

AROUND Detroit

Tight pig iron supply makes automotive casting manufacturers apprehensive over summer outlook . . . Foundries consider possibility of establishing own source of pig iron

By A. H. ALLEN
Detroit Editor
THE FOUNDRY

FOUNDRY pig iron again has tightened up in supply, and anxious melters furnishing castings to the automotive industry remain apprehensive over the summer outlook. One leading merchant supplier was forced to curtail shipments recently because of emergency repairs required by a blast furnace. Meanwhile, steel plants continue to use as much pig as possible in open-hearth charges. With scrap prices trying to break through the so-called "formula" levels in several districts after a long period in which steel companies held the line, it appears there will be no early change to higher scrap charges in open hearths.

Great Lakes Steel Corp. has found its iron requirements stepped up appreciably with the start of duplexing open-hearth heats. Molten iron is now transferred to one of two new 25-ton bessemer converters where it is blown down to a carbon of about 1.5 per cent and then poured into ladles which are immediately transferred to the open-hearth department. The few minutes required partially to refine the iron cut about 25 per cent off the time needed to finish it up into steel in the open hearths. Thus more steel is being poured daily.

In Great Lakes' No. 2 open-hearth shop, oxygen is being used in three of the four 200-ton furnaces further to speed up melting and refining. At the start of a heat oxygen is manifolded into the end burners for the scrap meltdown period, alternating every 15 minutes from one end to the other. During the final refining period oxygen is introduced through the monkey wall at the rear of the furnace through two 20-ft water-cooled jets which can be moved in and out of water-cooled ports in the wall by a motor and chain drive. Oxygen flow through end burners is at a rate of about 25,000 cu ft per hr, and through the jets at 30,000 cu ft per hr. It is chemically pure oxygen and is brought into a central oxygen station in liquid form in tank cars. It is not admitted during the entire heat period, just at the start and finish.

* * *

IN THE last six weeks there have been a number of enforced shutdowns among automobile manufacturers, ascribed principally to lack of sufficient flat-rolled steel. All General Motors divisions, for example, were closed for a week in June. Packard and Hudson also suspended for a few days over the Fourth of July holiday. These interruptions have permitted some building up of inventories of pig iron and coke in foundry departments, although not to the point where they could be considered comfortable. One source for foundry coke has had to curtail shipments because of increased diversion of coke to its blast furnaces, occasioned by the withdrawal of an outside source for blast furnace coke. Detroit delivered prices on foundry coke were increased 90 cents a ton early last month, bringing the figure to $21.65 per net ton, or 62 per cent over the price just three years ago.

Nettled over the haggling and dickering of the last few years in the effort to sustain a supply of foundry pig iron, some foundrymen are turning over in their minds the feasibility of banding together and establishing their own source for iron. A group of, say, a dozen or more large melters might subscribe sufficient funds to build or buy suitable blast furnace facilities and allocate the production therefrom among the pool in proportion to the amounts pledged. It is reasoned that such a "community" source for pig iron might well fill in the gaps in supply available from merchant furnaces which, over the years, have been dwindling in number, and also make iron available virtually at cost, since there would be no need for such a plant to charge anything more than cost of operation plus amortization of equipment.

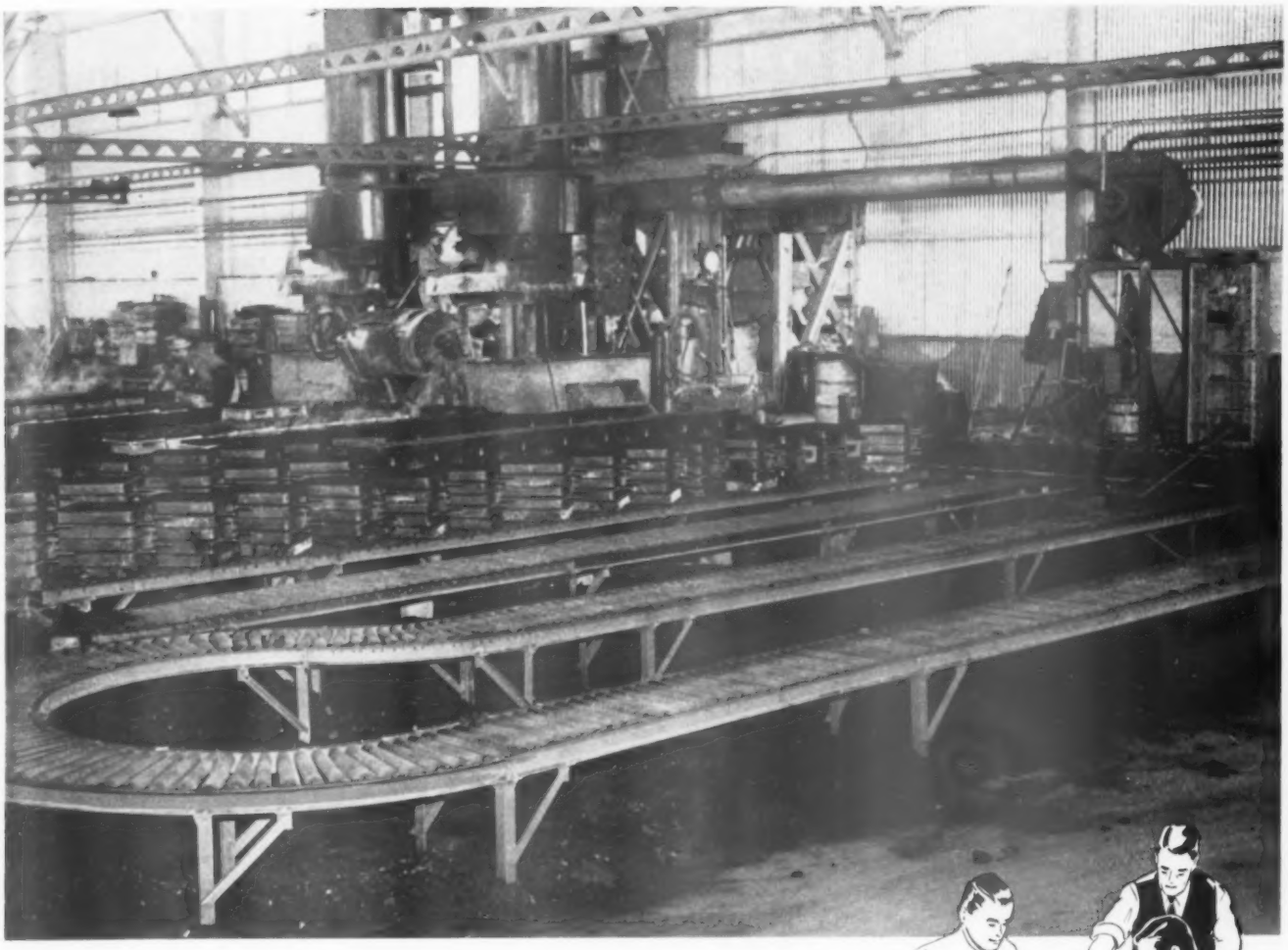
The idea parallels the "co-operatives" which unions, farmers and other groups have set up to supply food and living essentials at cost, eliminating the middleman's profit and the slice due the tax collector. It is interesting to conjecture how the government tax people might regard a co-operative blast furnace operated by a group of foundries, which had no profits to chop up.

Briquetting of coke breeze with cement, first mentioned in this department several months ago, is continuing at the Pontiac foundry where over 350 tons have been charged into foundry cupolas since the project started early this year. Shipments of the briquetted breeze have been made to a number of other foundries —Buick, Campbell, Wyant & Cannon, etc.—with results said to be not too encouraging. However, it is a good bet that considerably more will be heard of the technique, and in the not too distant future.

* * *

A STRIKE of UAW tool and die makers in 77 Detroit area shops which, as of this writing, was dragging into its fourth week, has forced suspension of a large volume of tool and die work for 1949 models slated to be on assembly lines late this year, and at the same time has forced several foundries specializing in large stamping dies to cut back operations sharply. One Detroit foundry, for example, operated only three days over a period of one month.

New Chevrolet, Pontiac, Buick and Oldsmobile bodies were scheduled to be in production around Nov. 15; this date probably will not be met because of the tooling delay and also because of repeated delays in the 1948 model schedules. Chrysler will have a whole new series of models for its four divisions along the turn of the year. Nash will have new models in production by October. Ford is gradually stepping up the assembly pace on Ford, Mercury and Lincoln despite numerous snarls developing over short supplies of materials and parts, plus minor difficulties in early production. Kaiser-Frazer shortly will introduce a series of redecorated models for 1949, carrying more chrome trim and other minor modifications, and will add a convertible with retracting steel top to its line. Willys-Overland on July 20 unveiled its long-awaited sports phaeton or "jeepster" model, combining the rugged characteristic of the jeep with sporty, continental lines. It is planned to build 15,000 of the new jobs this year.



What's behind a really good conveyer system . . . ?

■ Really good conveyer systems — those which serve production and cut handling costs to a very minimum — are not just bought and installed. Behind such systems — and the smooth flow of materials they create — are months of planning and engineering in the field, hours upon hours of detailing, careful fabrication based on these details, and finally installation supervised by experienced conveyer erectors.

The development of fine systems, and the gravity and power conveyers and special conveying machinery which go into them, requires the facilities of a complete organization — people who are equipped to handle a job from the stage of imagination through to its efficient operation in the plant for which it was designed.

Such is the work of the Mathews organization. It makes available to both light and heavy industry in the United States and Canada nearly half a century of engineering and manufacturing experience, and the facilities of three modern plants. It's a busy organization, but would like to reserve some time for ***your*** handling problem, too.

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PORT HOPE, ONTARIO

Engineering Offices or Sales Agencies in Principal American and Canadian Cities

MATCHPLATES

Made From Plastic

DURING the war a castable synthetic resin or plastic developed by Calresin Corp., Culver City, Calif., found wide application in the aviation industry as dies in the press-forming of aluminum alloy sheet, for router and nesting fixtures, and for master mock-ups. With the advent of peacetime activities the research department of the firm sought other applications, and determined that the foundry industry offered a wide use in manufacture of patterns, matchplates and coreboxes.

Study of these products resulted in a definite procedure for making them, and the practice employed by Larson Yacht Service, Chicago, is described here.

First step in the production of a matchplate constructed wholly of the plastic, except for a metal supporting frame, is making the follow board in which to locate the selected patterns in the desired relationship. The follow board is made by pouring gypsum cement in an aluminum frame, with 12 x 18-in. opening in the center—the plate extending 1½ in. on each of narrow dimension and 3 in. on the wider.

After the plaster is set the follow board is taken to a drill press and a depression or cavity machined in the surface with an end mill to accommodate the patterns. Patterns are then located in the cavity with plastilene and the same material is built up around the patterns to establish the proper parting as shown in Fig. 1.

Patterns and aluminum frame are sprayed with plastic sealing lacquer which dries in an hour or hastened by use of infra-red lamps. All surfaces then are swabbed with a generous coating of paste wax and polished with a soft cloth or brush.

A special flask as shown in Fig. 2 is positioned over patterns and frame by locating pins in opposite corners, and liquid plaster poured in. To aid in separating patterns and mold several small brass pins are placed on the high points of the patterns. The assembly is turned over, the aluminum frame, follow board and plastilene removed leaving the patterns in position in the mold. Patterns and mold face are sprayed with lacquer sealer, waxed and polished. Another flask is located over the first by means of pins and filled with plaster.

After the plaster has set the molds are separated, the patterns removed and the mold surfaces lacquered and waxed. As shown in Fig. 3 a wood

(*Concluded on page* 124)

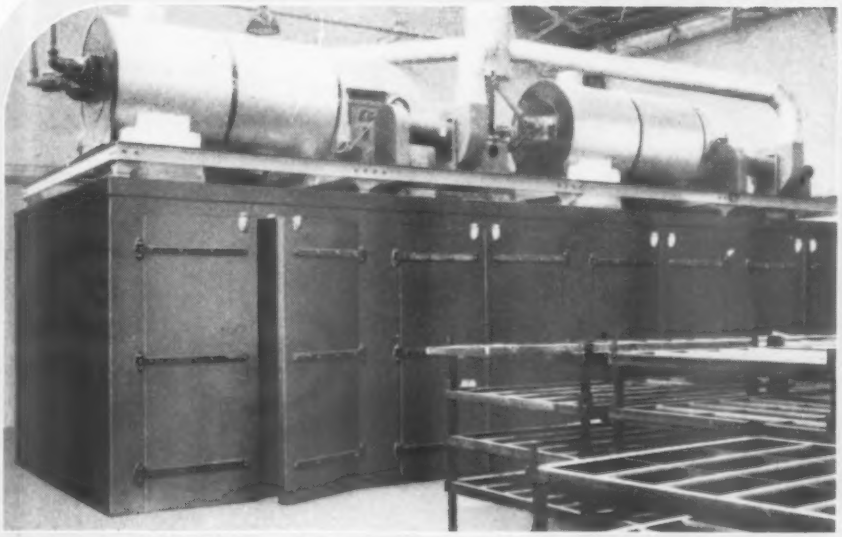
Fig. 1—Establishing parting for patterns located in follow board

Fig. 2—After special flask is positioned over patterns and frame, liquid plaster is poured into flask

Fig. 3—Glass fiber sheets placed over one half of the mold. Holes in side of separator frame act as vents when the assembly later is filled with plastic

Fig 4—Mold halves clamped together and attached to pressure tank

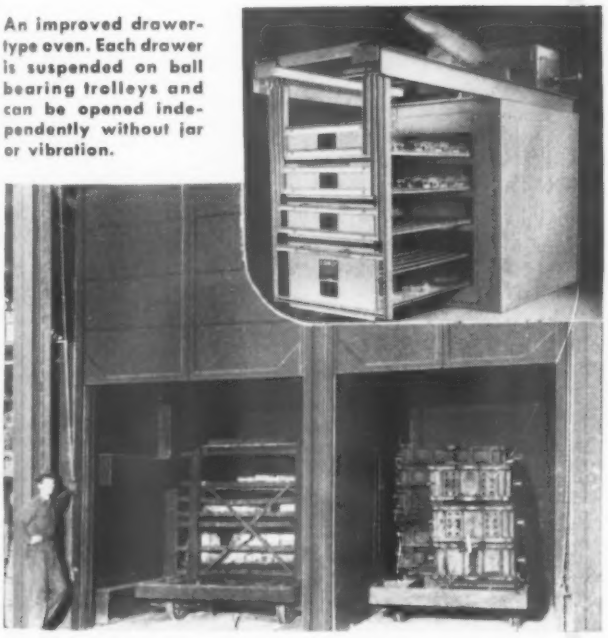
LANLY *Dual Fuel* OVENS



A four-unit rack-type oven with each compartment individually heated.

THOROUGHLY PROVEN
•
TIMELY
•
EFFICIENT
on either Gas or Oil
•

An improved drawer-type oven. Each drawer is suspended on ball bearing trolleys and can be opened independently without jar or vibration.



A typical Lanly car type mold drying oven. Each compartment is individually heated and controlled.

REGARDLESS of what fuel change-over crisis the morning may bring, no interruption of production will be entailed if you install LANLY Dual Fuel OVENS. The switch from gas to oil, or vice versa can be made in a matter of seconds by turning two valves and throwing a switch.

So efficient and satisfactory are these ovens that most recent Lanly foundry installations have been of this Dual Fuel type.

The Lanly recirculating, convection type heater is not only highly efficient but uncommonly versatile as to installation.

This makes practical its application to ovens of other makes and the satisfactory modification of older equipment.

Isn't it time to do something about the fuel situation to avoid further difficulties and costly interruptions? If you need a new oven there is a Lanly exactly adapted to every requirement. If you have equipment that can possibly be modernized Lanly consultation is available without obligation.

Fill in—clip—and mail the coupon for information.

THE LANLY CO.
OVENS FOR INDUSTRY
HEATED BY GAS, OIL, ELECTRICITY OR STEAM
750 PROSPECT AVENUE CLEVELAND, OHIO

The LANLY Co.
Cleveland, Ohio

☐ Send information regarding Dual Fuel Ovens.

☐ Contact us regarding remodeling our ovens to use gas or oil.

☐ Have representative call when in this vicinity.

Company . . . . . .

Address . . . . . By . . . . . .

Fig. 5—Flask being separated to remove cured matchplate

Fig. 6—One side of the completed matchplate

(*Concluded from page* 122)

separating frame ½-in. thick, and its interior edges lacquered and waxed, is placed over one half of the mold with the cavity uppermost. Glass fiber "swirl" sheets cut to the desired shapes are placed in the opening, and with the ½-in. thickness five sheets are used. As may be observed in Fig. 3 one side of the separator contains six ¼-in. holes which form vents for egress of air when the assembly later is filled with plastic. Opposite side of the separator contains a deep groove along its whole length which extends to a hole drilled perpendicular to the groove.

With the glass fiber sheets in position, the other half mold is located in position by the dowel pins and the assembly clamped together as shown in Fig. 4. A pipe nipple is screwed into the hole in the separator frame. The nipple in turn is fitted with a coupling and shut-off cock to which is attached the hose from a 5-gal. pressure tank such as used for paint or lacquer spraying.

A pipe union is used between the hose and the pressure tank, and a valve is located between the pipe union and the elbow leading into the cover of the pressure tank. On the underside of this cover and integral with the elbow entering the tank cover, is a pipe which leads nearly to the bottom of the pressure tank.

A metal can containing the catalyzed liquid plastic is placed in the pressure tank so that this length of pipe will reach to about ¼-in. from the bottom of the container. The lid is put in place on the tank and clamped so that it is pressure tight. Air is applied to the tank through a pressure reducing valve, 15 and 20 psi being applied to the tank. When the valves leading to the flask assembly are open, the liquid plastic flows upward into the flask; all air being driven out ahead of the plastic material.

When the plastic material reaches the top it will, of course, flow out of the vent holes previously mentioned. These holes can be plugged with tapered wooden dowels if desired after the plastic has reached the top of the holes. When the flask is full the valve next to the flask is closed so that the plastic material will not flow back out of the flask. The hose then is removed, the container in the pressure tank removed, and the hose and pipe fittings immediately cleaned with alcohol. The plastic material in the valve will, of course, harden, but it is easily removed by disassembling the valve and knocking out the hardened plastic. The valve, the hose and all of the pipe fittings can be coated on the inside with wax or grease if desired.

Sometimes during the casting operation it may be desirable to gage the liquid plastic into the flasks. This can be accomplished by mounting a pipe nipple and a gas-cock valve in the cover of the pressure tank. In order to gage the liquid level inside the tank, first shut the valve in the hose line leading to the flask. This should be done with the valve next to the pressure tank. Shut off the air to the tank and bleed the air out of the tank. This is done by a relief valve which is attached to the tank cover and cannot be seen in the illustration. When the air has been completely removed from the tank, the valve mentioned previously can be opened, and a wire shoved down through the valve and the pipe nipple into the container inside the tank. On withdrawing the wire the liquid level can be read similarly to reading the oil level in the crankcase of an auto. After reading this gage, the valve through which the wire was placed should be closed and air again applied to the pressure tank, after which the valve on the hose line is opened so that the material will again flow upward into the flask.

Can Be Gravity Poured

The matchplate can, of course, be cast by pouring the liquid resin into the top of the flask, in which case part of the top member of the wooden frame can be removed, or the flask can be reversed so that the wide member of the side piece shown in Fig. 4 is at the top, and instead of drilling the large hole from the side of this member, drill it from what will now be the top and attach a funnel to it. Air relief holes can be drilled along the edge of this member and in that way the matchplate can be cast from the top. However, casting by the pressure method has a distinct advantage in that the liquid plastic is being taken from the bottom of the container where it has few or no air bubbles entrapped and the rising level of the plastic material drives the air out through the top.

Fig. 5 shows the flask being taken apart to remove the cured matchplate. In order to separate the two halves of the flask a series of holes have been drilled and tapped through the aluminum flask and a long set screw threaded into each of these holes. The lower end of the set screw, during the casting operation, should not quite reach the machined surface of the flask. The screw should be backed out about two threads and this cavity filled with plaster of paris or clay. When the flask has cooled a set screw wrench is used to turn the screws uniformly, about one-half turn all around the flask. This should be repeated until the flask has separated far enough from the matchplate so that it can be lifted off easily. After one side has been removed the other side can be removed in exactly the same manner. Fig. 6 shows one side of the completed matchplate.

Sly Dust Filter mounted over Sly Blast Room

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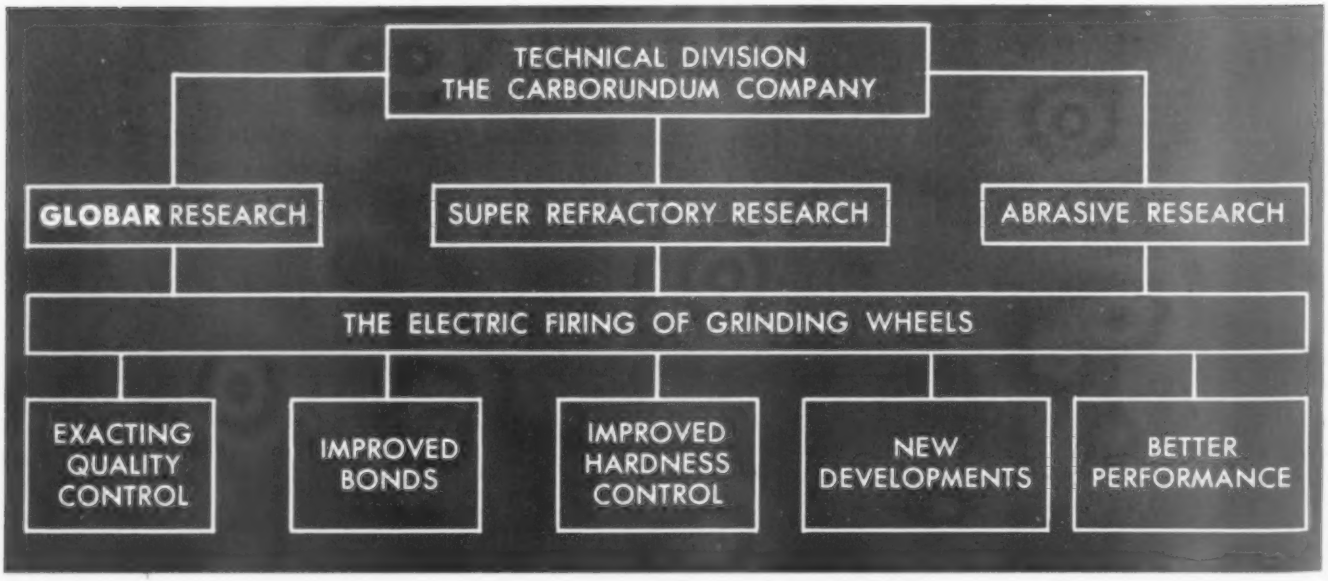

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FOUNDRY Developments

By EDWIN BREMER

COMMITTEE A-3 on Cast Iron of ASTM recently proposed new tentative specifications for gray iron castings for elevated temperatures for non-pressure containing parts. They cover three classes of gray iron suitable for castings exposed to temperatures encountered in such service as grate bars, stoker links, stoker parts, oil still furnace parts, firebox parts, ingot molds, glass molds, caustic pots and metal melting pots. Classes are I, possessing superior resistance to thermal shock; II, possessing average resistance to thermal shock and a moderately good tensile strength (tensile strengths above 30,000 psi may be expected); and III, possessing a higher tensile strength than either Classes I or II (tensile strengths as high as 40,000 psi may be expected). Irons are classified according to their carbon content equivalents calculated on C + 0.3 (Si + P). Class I carbon equivalent is 3.81 to 4.40 with a 3.50 per cent min. C; Class II carbon equivalent is 3.51 to 4.10 with a 3.20 per cent min C; Class III carbon equivalent is 3.20 to 3.80 with a 2.80 per cent min C. Allowable silicon ranges predicated on various permissible carbon contents are also included. Phosphorus max is 0.60 per cent and sulphur max 0.12 per cent. Three basic classes may be alloyed with chromium and then are subdivided into types A containing 0.20 to 0.40 per cent Cr; type B with 0.41 to 0.65 per cent Cr; type C with 0.66 to 0.95 per cent Cr, and type D with 0.96 to 1.20 per cent Cr.

° ° °

NICKEL impurities in electrolytic cobalt can be determined by spectrographic analysis, according to the Bureau of Mines. Practicability of the procedure was demonstrated by using an internal standard method of spectrochemical analysis and an electronically controlled direct current arc. Data are presented in Report of Investigations 4198 "Spectrochemical Determination of Nickel in Electrolytic Cobalt Using a Current Regulated Direct Current Arc" by Clyde A. Bridger and Graham W. Marks. Copies of the report may be obtained from Bureau of Mines, Publications Section, 4800 Forbes St., Pittsburgh 13.

° ° °

MOST recent addition to list of materials for inoculation of gray iron is an alloy containing 60 per cent nickel, 30 per cent silicon and remainder iron. It is claimed to have a high specific gravity which aids in immersion and distribution in the molten metal. Melting point of the alloy is 1800°F. Available in convenient particle size for ladle or spout addition, the amount of the inoculant employed may range from 0.10 to 2.00 per cent or more, but the usual range is from 0.50 to 1.00 per cent. Addition should be made not more than ten minutes before the iron is poured into the mold.

° ° °

DEVELOPMENT of superspeed x-ray motion pictures opens fascinating new visual worlds to science. It can analyze the internal structure of rapidly moving objects and human organs, and brings to x-ray analysis the same advantages slow-motion movies brings to sport events. Superspeed x-ray movies developed in the Westinghouse Lamp Research Laboratories, Bloomfield, N. J., team up x-ray exposures of 10 millionths of a second and a shutterless camera shooting movies at 100 frames a second. Since x-rays are unaffected by strong light and fumes which obscure conventional motion pictures made in visible light, and also are able to penetrate solid materials, the technique may solve how molten metal flows in a mold.

° ° °

ENGLISH firm claims development of a new steelmaking process which will prove as revolutionary as the bessemer converter. New process, it is said, will enable rolling mills to cast their own steel billets instead of bringing them in from steelworks. Rudimentary principle, according to the report, is that light scrap, which is easily obtainable and of little use to steelmakers, and other metals can be fused with a mixture discovered by the inventor and melted into the finest quality steel ready for pouring into molds.

° ° °

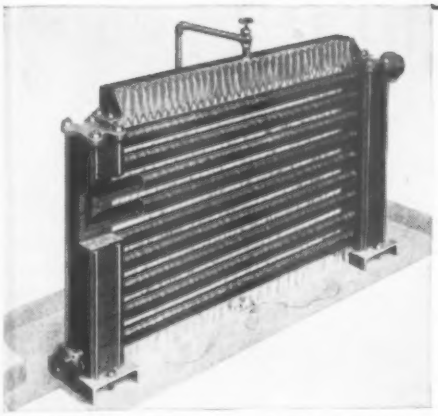
RECENT release from Office of Technical Services, Department of Commerce, Washington 25, states that report PB-85139, "Production Methods of Wall Board and Wood Substitute" contains a brief description of design and construction of large paper drying rolls or cylinders made by J. M. Voith Co., Heidenheim, Germany. Rolls are made in shell or cylinder form and cast in pits. Largest dryer roll built by firm had a diameter of 16 ft, a face of 15 ft and weighed 72 tons. Report consisting of 21 pages, mimeographed, may be secured for 75 cents.

° ° °

COATED with approximately 30,000 minute glass spheres to the square inch, plastic-backed and fabric-backed material now is available for night light-reflective applications such as traffic signs, warning signs on rear of busses and trucks, and advertising signs. It can be woven into outer garments such as jackets, raincoats and sportcoats, and since two-thirds of the pedestrians who die in automobile accidents are struck at night, the light-reflective material may aid in reducing the accident toll.

° ° °

CUPOLA heats which start to freeze up due to some operating difficulty such as bridging, poor coke, etc., can be saved from dropping bottom by emergency use of bottled oxygen added into the blast line, according to a paper by W. C. Wick on "Oxygen-enriched Cupola Blasts" presented at the AFS annual meeting. Amount added in one case was 8 per cent and the temperature of the metal increased almost immediately, enabling completion of the heat without further difficulty.



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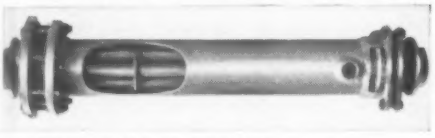
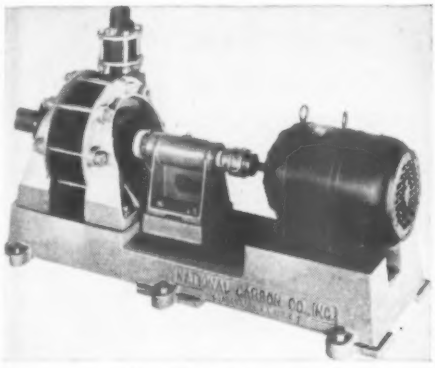
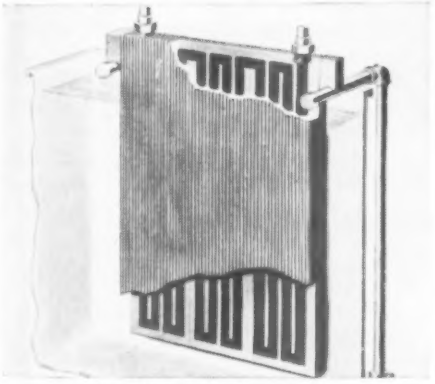


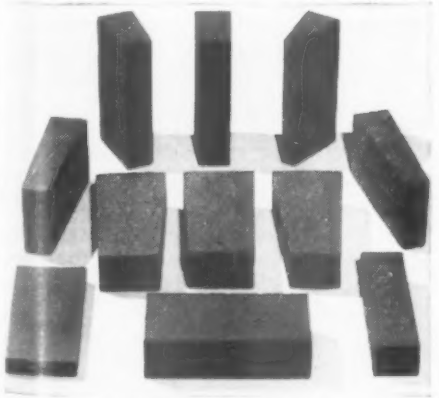
"Karbate" Series 70 Heat Exchanger



"Karbate" Pump



"Karbate" Plate Heater



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STEEL FOUNDER'S SOCIETY

Considers Technical and Operating Problems

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

THIRD annual conference of the Technical and Operating Committee of the Steel Founders' Society of America was held at Hotel Statler, Cleveland, June 3 to 5, and hit a new high record for attendance with 340 present. Conference was opened Thursday morning, June 3, by John F. Lacey, Commercial Steel Castings Co., Marion, O., and chairman of the Technical and Operating Committee. Welcoming address was by F. K. Donaldson, Machined Steel Casting Co., Alliance, O., and president of the Steel Founders' Society.

First technical session, with S. E. Mueller, Falk Corp., Milwaukee, and J. O. Shive, Sterling Steel Casting Co., East St. Louis, Ill., presiding, dealt with exothermic materials for pipe elimination and feeding aids, and various phases of the problem were discussed by different speakers. C. H. Wyman, Burnside Steel Foundry Co., Chicago, spoke on metallurgical factors, and pointed out that exothermic riser materials created heat as well as an insulating slag when applied. He presented data on several different types of steel poured into typical test blocks with and without use of the exothermic riser material.

Yields Are Increased

He found that chemical analyses were the same in both blocks, physical properties were about the same or slightly improved, that the density as determined by boiling nitric acid etch was better when the exothermic material was used, and that inclusions were fewer, smaller and better distributed. On application to two different types of small castings the yield was increased from 58.4 to 73 per cent, and from 52.6 to 75.4 per cent, respectively. He also mentioned that the time of addition of the material to the riser was important, since pouring temperature of metal, volume and size of riser, mold material, and size of casting affect feeding characteristics. He said that practice in his foundry was to add the exothermic material to the riser when the center point of the riser was completely frozen and resisted puncture.

R. A. Willey, Commercial Steel Casting Co., Marion, O., discussed use of exothermic riser material on small and medium size castings, and said that if the riser was increased only in height there was a tendency for shrinkage at the junction of casting and riser. Hence, the riser should be proportioned properly to obtain required feeding. Use of exothermic riser material permits an increase in yield through reduction in height of riser required, and he described some heavy gear blanks and gear castings where height of riser was reduced from 16 to 3¾ in. by use of the material. Time of addition of the compound is when the riser is mushy. He also showed a chart which had been developed giving the cross-sectional areas of various size risers and the height to which the riser must be filled with metal, as well as the amount of exothermic material to be added. Indicators such as wires or nails were located in the risers to designate the proper filling point.

C. F. Haertel, Falk Corp., Milwaukee, in a paper prepared in collaboration with S. E. Mueller of the same firm, described the use of the riser material on heavy castings, and said that ordinary risers were 30 to 35 per cent efficient. By using exothermic riser compound riser height on heavy steel castings had been reduced two-thirds, and overall foundry yield had increased 10 per cent. He cited a number of examples of increase in yield by use of the compound in risers including a 14,200-lb casting where the yield was increased from 30 per cent to 56.4 per cent; a 79,800-lb casting increased from 54.4 to 78.1 per cent; a 19,000-lb casting from 45.2 to 71.2 per cent, and a 68,000-lb casting from 54.4 to 75.2 per cent. Exothermic material was placed on the riser without delay on cross-sectional areas up to 70 sq in.; from that up to 900 sq in. a delay of 0.25 minutes for each additional 5 sq in. was allowed, and over 900 sq in. the delay was 45 minutes.

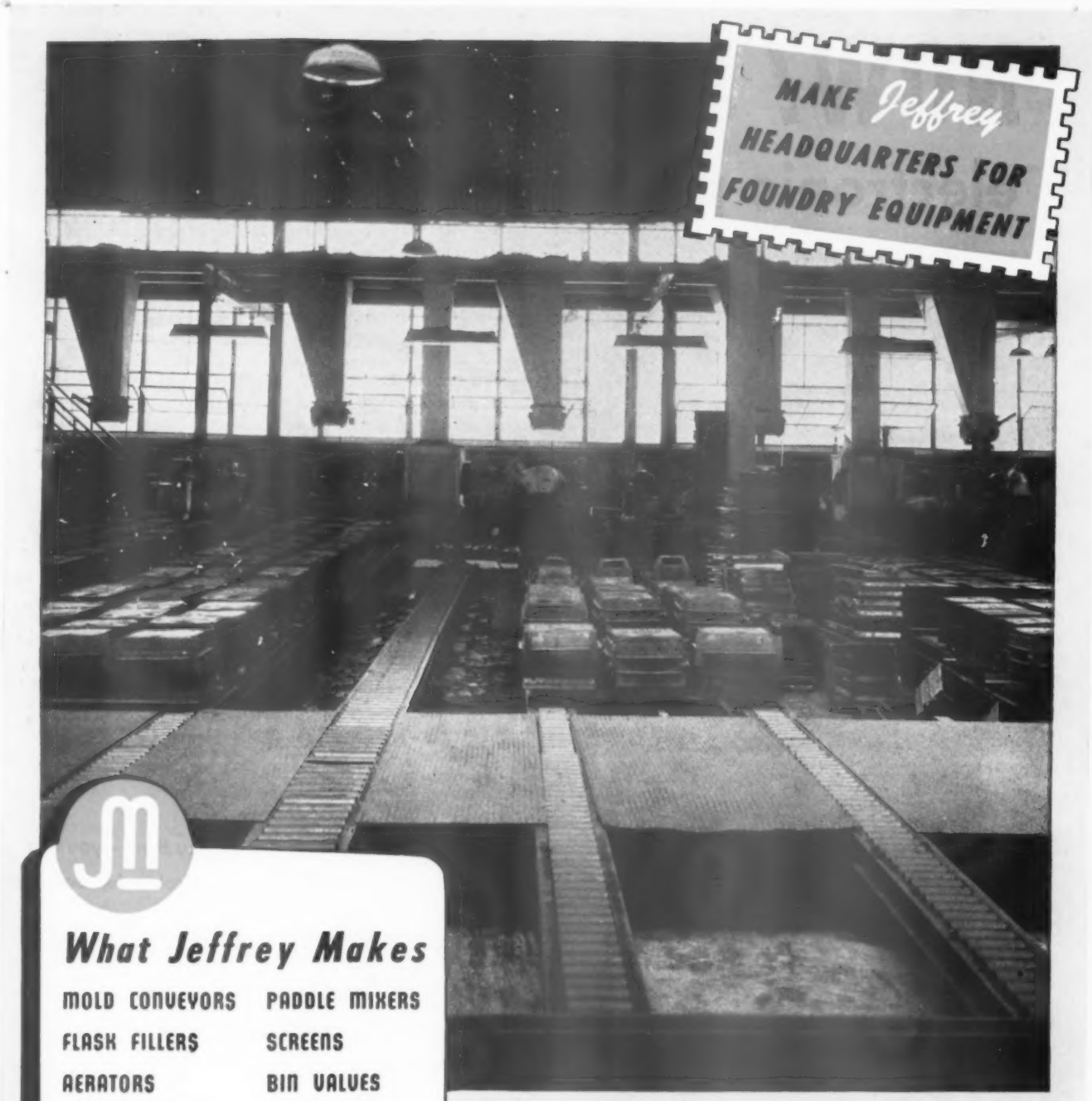
M. J. O'Brien, Symington-Gould Corp., Depew, N. Y., in discussing use of exothermic riser material for production castings said that he was using about 30 per cent less than the amount recommended by the manufacturer, with good success. On one casting use of the compound permitted reduction of riser weight from 1829 lb to 929 lb; in another the yield was increased from 55 to 84 per cent, and in making a large drop ball casting a yield of 90.6 was obtained. Mr. O'Brien presented a chart indicating the riser size, amount of riser compound, height of riser to be poured and waiting time before adding the compound. No waiting time was required on risers up to 6 in. when ½-minute was allowed. An additional ¼-minute each was allowed for 7 and 8-in. diam risers, and ½-minute for each 1-in. increase in riser diam beyond 8 in. R. E. Kerr, Pettibone-Mulliken Corp., Chicago, discussed application of two types of materials in production of cast crankshafts made of an alloy steel containing 1.75 per cent C with a wide solidification range.

Improve Goggle Protection

At an industry luncheon Thursday noon, with John F. Lacey as toastmaster, the Technical and Operating Committee Medal was presented to Charles L. Heater, American Steel Foundries, Chicago, for his service during 1947. F. J. Macready, American Cast Iron Pipe Co., Birmingham, Ala., spoke on "The Results of a Goggle Investigation," and pointed out that under certain conditions goggle lens might be struck by flying particles with a 2-ft-lb impact. By use of a cellulose acetate lens 0.003-in. thick behind the regular lens, shattered particles were prevented from entering the eye.

Thursday afternoon's session was devoted to a symposium on methods of reducing time and cost of pattern construction in which 12 speakers participated. Meeting was under the direction of W. J. Temple, Kincaid-Osburn Electric Steel Co., San Antonio, Tex., and E. R. Howells, Bethlehem Steel Co., Steelton, Pa. A. A. Diebold, Atlas Steel Casting Co., Buffalo, described the sweep-mold method as applied in the production of large dome-shape gear wheels, and stated that while molding cost was somewhat higher, the cost of the sweep was about one-eighth that of a pattern. P. H. Stuff, Ross-Meehan Foundries, Chattanooga, Tenn., mentioned the procedure where 37 patterns were employed to produce 350 different types of cast steel heater channels. H. M. Walters, Bethlehem Steel Co., Steelton, Pa., discussed a combination sweep and core method for producing a ladle bail for a slag car. L. O. Sturkie, Hughes Tool Co.,

(*Continued on page* 133)



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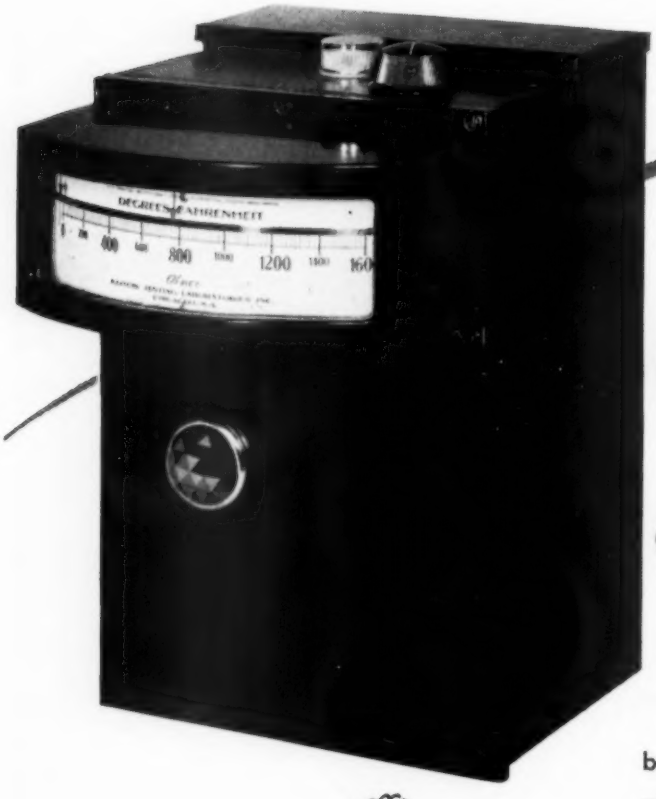

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(*Continued from page* 130)

Houston, Tex., prepared a paper on making oil well bits which was read by Mr. Temple.

W. D. Kloss, National Malleable & Steel Castings Co., Sharon, Pa., described the use of replaceable sections on patterns and coreboxes at points subject to considerable wear. W. T. Bland, Commercial Steel Casting Co., Marion, O., presented a method of mounting patterns on a board which in turn could be inserted into a frame to form a matchplate. Use of plastic materials for patterns and coreboxes was discussed by a number of speakers including A. S. Klopf, Western Foundry Co., Chicago; L. G. Gustafson, Continental Foundry & Machine Co., East Chicago, Ind., and F. Schumacher, Cooper Alloy Foundry Co., Hillside, N. J. L. A. Kleber, General Steel Castings, Corp., Granite City, Ill., described the use of muslin-back paper for replacement of wood and metal layouts. L. A. Dabler Jr., American Steel Foundries, East St. Louis, Ill., pointed out that employment of one man for layout, templates, etc., for a casting reduced the chance of error and saved considerable time in preparation. E. L. Hammer, Carnegie-Illinois Corp., Johnstown, Pa., described an overhead shaper used in the patternshop which performed a variety of operations with ease.

Introduce Quiz Program

Friday morning's session comprised a "Do You Know?" panel discussion of misunderstood fundamentals concerning steel castings by a number of experts under the direction of R. C. Heaslett, Continental Foundry & Machine Co., Coraopolis, Pa., and H. G. Robertson, American Steel Foundries, Alliance, O. An unusual feature was the presentation to each in attendance of a printed questionnaire containing nine statements with columns for checking true or false. After those were filled out, they were collected, and the experts then discussed the statements, giving reasons why they were true or false. J. B. Caine, Sawbrook Steel Castings Co., Lockland, O., pointed out that molding sand on the wet side is less inclined to produce sand defects than when on the dry side. R. A. Gezelius, General Steel Castings Corp., Eddystone, Pa., said that temper brittleness is confined entirely to alloy steels. G. A. Lillieqvist, American Steel Foundries, East Chicago, Ind., reported that cellulose coated welding rods do not promote soundness and uniform hardness in weld metal and heat affected zone.

Howard F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass., showed that heavy walled sections of steel castings are easier to feed sound with open-top risers than are thin walls. C. E. Sims, Battelle Memorial Institute, Columbus, O., stated that distribution and effect of hydrogen are controlled by its high degree of segregation. Charles Locke, Armour Research Foundation, Chicago, described why increase in riser height does not always eliminate shrinkage under it.

E. C. Troy, National Engineering Co., Philadelphia, pointed out that for green sand molding the sand should possess high deformation. E. J. Wellauer, Falk Corp., Milwaukee, presented information showing that yield point of cast steels for given tensile strengths is equal to that of heat treated wrought steels, and C. W. Briggs, Steel Founders' society, showed curves which indicated that within the chemical ranges normally employed for carbon and low alloy steel castings, the addition of carbon and of chromium had no effect on fluidity; additions of molybdenum tended to decrease fluidity, and copper and nickel additions increased fluidity.

Session on Friday afternoon dealt with maintenance of steel foundry equipment, with A. A. Diebold, Atlas Steel Casting Co., Buffalo, N. Y., and C. N. Wilcox, Electric Steel Foundry Co., Portland, Oreg., presiding. Types of equipment discussed and speakers included: Stationary sand slingers by F. E. Abraham and P. J. Cronin, American Steel Foundries, East St. Louis, Ill.; mobile sand slingers by E. H. Blanton, Atlantic Steel Castings Co., Chester, Pa.; Rotoblast machines by C. R. Bachman, Crucible Steel Casting Co., Lansdowne, Pa.; hydroblast machines by H. B. Meyer, Erie Forge Co., Erie, Pa.; pressure blast room equipment by W. H. Peck, Oklahoma Steel Castings Co., Tulsa, Okla.; Wheelabrator machines by F. W. Ladwig, St. Louis Steel Casting Co., St. Louis, and shakeout machines by John Buck, Scullin Steel Co., St. Louis.

On Saturday morning various divisions of the Technical and Operating Committee discussed heading and gating two problem castings. One was a 4-in. wedge gate valve weighing about 90 lb, the other a large valve body for a hydroelectric installation weighing around 18,000 lb. E. R. Howells, Bethlehem Steel Co., Steelton, Pa., and S. E. Mueller, Falk Corp., Milwaukee, presided. Both castings were to be subjected to radio-

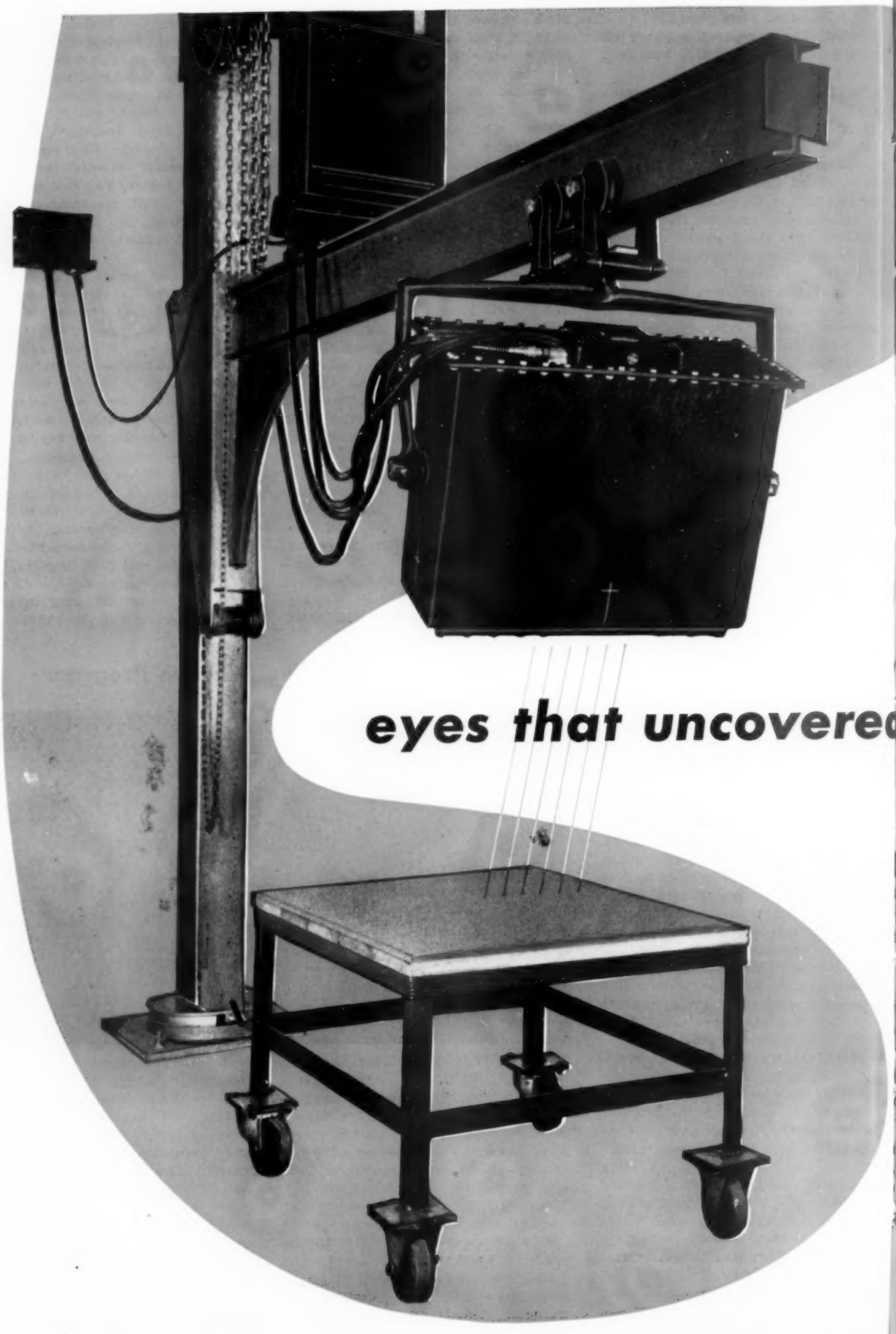
(*Concluded on page* 136)

Studies Safety and Hygiene Program

HAMILTON FOUNDRY & MACHINE CO.'s safety and hygiene program was the subject of special attention by James H. Fluker, superintendent, safety and hygiene division, Industrial Commission of Ohio, who recently toured Hamilton's plant and attended a regular bimonthly meeting of the workmen's safety and hygiene committee which acts upon safety and hygiene recommendations made by employees.

The committee is shown above in attendance with Mr. Fluker and Peter E. Rentschler, company president. Left to right are: Clayton Overholts; Remus Smith; William Evans; Oscar Eschenbrenner; Mr. Fluker; Mr. Rentschler; Eldon Altman, personnel and safety director and committee chairman; Larry Hessler; Clara Elliott; Paul Gardner and Gus Wirth.

The company's accident frequency rate during the first five months of this year was 6.1 accidents per 1 million man-hours worked. This is substantially better than the national average for either the foundry industry or all industries.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• General Electric X-Ray Corporation leads the way in shaping the forces of electronics to every industrial need. There are industrial x-ray units for visual inspection of light metal castings, packaged goods and small assemblies. Other G-E X-Ray units tell a story of economy for the heavy metal industry. And G-E Diffraction units analyze metals, chemicals and metal alloys at a cost lower than by any other method.

ed 35,000 *a month in a scrap heap*

THE complicated design of a 40-pound flywheel housing ant trouble for the foundry. Too many flaws showed p in too many castings. 12 out of each 100 ended as rap. Resulting losses were heavy. Even more serious re delays in deliveries.

Stepped-up production, at that time, was out of the estion. Management looked again at the rusting scrap ap. Could the rejected parts be salvaged?

Welding was an answer. Flaws were burned out and e metal filled in. But were the welded castings as und? And, if so, could the customer be convinced?

The foundry's General Electric Industrial X-Ray it made "portraits" of the two types of castings showed the one equal in quality and soundness to the other. The films convinced the customer.

Deliveries got back to normal. $35,000 a month in castings was plucked from the scrap heap. A 20% saving was passed on to the customer. Industrial x-ray once again more than paid for itself on the first assignment.

In the casting of steel and the molding of plastics; on scores of assembly lines, G-E Industrial X-Ray curbs waste, speeds production, helps build better goods. Is there a place for industrial x-ray in your business? A General Electric X-Ray engineer will be glad to talk it over. Write or wire. General Electric X-Ray Corporation, Dept. H-37, 4855 McGeoch Ave., Milwaukee 14, Wisc.

GENERAL ELECTRIC X-RAY CORPORATION

• General Electric X-Ray Corporation manufactures and distributes x-ray apparatus for industrial, dental and medical use; electromedical apparatus; x-ray and electromedical supplies and accessories.

(*Concluded from page* 133)

graphic and magnetic particle inspection and data included all costs for manufacture. In the case of the 4-in. valve specimen castings were submitted and several ingenious methods were employed. Yields from 41 to 62.4 per cent were obtained.

Speakers from the various divisions presenting the consensus on the 4-in. valve included: K. V. Wheeler Jr., American Steel Foundries, Newark, N. J.; J. B. Brown, Pratt & Letchworth Co. Inc., Buffalo; W. J. Temple, Kincaid-Osburn Electric Steel Co., San Antonio, Tex.; F. J. Snyder, Reliance Steel Casting Co., Pittsburgh; V. E. Zang, Unitcast Corp., Toledo, O.; G. C. Dickey, Harrison Steel Castings Co., Attica, Ind.; H. Schulte, Key Co., East St. Louis, Ill., and C. N. Wilcox, Electric Steel Foundry Co., Portland, Oreg.

Proposed methods for production of the 18,000-lb valve developed by the various divisions were presented by Messrs. Brown, Dickey and Zang; Gordon McMillin, General Steel Casting Corp., Granite City, Ill.; A. L. Wentzel, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. and F. J. Snyder, Reliance Steel Casting Co., Pittsburgh. The three-day conference closed with an industry luncheon.

MALLEABLE FOUNDERS ANNUAL MEETING

(*Continued from page* 83)

road cars, agricultural implements and many others.

Wilson H. Moriarty, National Malleable & Steel Castings Co., Cleveland, and president of the society, opened the first session by introducing a number of guests, including W. H. Cantelon, Auto Specialties Mfg. Co., Windsor, Ont., S. J. Frame, Canadian Malleable Institute, Toronto, and George D. Branston, representative of the foundry industry on the recent foreign scrap mission.

In his presidential address, Mr. Moriarty praised the progress that has been made in the malleable iron industry and referred to the growth of the society and its service to this industry. He strongly recommended that the industry plan now for a real celebration of the 150th anniversary of malleable iron, which will take place in 1951.

Mr. Moriarty stated that present operating schedules indicate the 1948 production totals probably will be the largest in the history of the industry. Along with tremendous production records have come advances in practices and in plant and equipment. In this march of progress the society has played an active part, and the planning and work of many years all have been of value in the future development of the malleable iron industry. The president mentioned a number of the activities which have served the industry, including the handbook, educational efforts, the technical activities—including the work with engineering schools and with technical societies—and the contacts with various governmental agencies. He reported briefly on the work of the various standing committees of the society.

Meeting Calendar

Sept. 24—Malleable Founders Society, industry meeting, Cleveland.
Sept. 23-24-25—National Association of Foremen, 25th anniversary meeting, Philadelphia.
Sept. 30-Oct. 1—Canadian Conference of Ontario and Eastern Canada-Newfoundland AFS Chapters, Montreal.
Oct. 12-16—American Chemical Society, Chicago Section, Fifth National Chemical Exposition, Chicago Coliseum, Chicago.
Oct. 13-14—Magnesium Association, mid-year meeting, Skytop Club, Skytop, Pa.
Oct. 14-15—Gray Iron Founders Society, annual meeting, Atlantic City, N. J.
Oct. 14-15-16—Foundry Equipment Manufacturers Association, annual meeting, White Sulphur Springs, W. Va.
Oct. 15-16—New England Foundrymen's Association, annual regional conference, Boston.
Oct. 22—Non-Ferrous Founders' Society annual meeting, Philadelphia.
Oct. 25-29—National Metal Congress and Exposition, Philadelphia.
Nov. 4-5—Metals Casting Conference, Purdue University, West Lafayette, Ind.
Nov. 11-13—Meehanite casting manufacturers, annual meeting, Pittsburgh.
Nov. 15-16—Steel Founders' Society of America, fall meeting, Hot Springs, Va.
Nov. 18-19—National Founders Association, annual meeting, Chicago.

1949

Feb. 9-10—Steel Founders Society annual meeting, Chicago.
Feb. 10-11—Wisconsin Chapters of AFS, regional conference, Milwaukee. (Tentative)
Feb. 17-19—Birmingham Chapter of AFS, regional conference, Birmingham.
Feb. 28-Mar. 4—ASTM Committee Week, Edgewater Beach Hotel, Chicago.
Mar. 10-11 — Ohio Regional Conference sponsored by Ohio AFS Chapter, Columbus, O. (Tentative)
May 2-5—American Foundrymen's Society, annual convention, St. Louis.
June 27-July 1—American Society for Testing Materials, annual meeting, Atlantic City, N. J.
Oct. 10-14—American Society for Testing Materials, Pacific Coast meeting, San Francisco.

Mr. Moriarty spent some time in discussing the important work of the society in the matter of allocations of pig iron and scrap. He stated that the current shortage of metallics and the resultant high prices of scrap have put the foundry industry at a disadvantage in a competitive field. The country is dangerously low in its supply of metallics, and the only remedy is to get back into this country as quickly as possible all of the available scrap scattered in various countries throughout the world. Mr. Moriarty suggested a government subsidy covering the cost of transporting this scrap back to this country. He stressed the importance of individual foundrymen contacting their representatives in Congress on this and other problems facing industry because of government action.

The president reported that during the year, the Malleable Founders' Society became a member of the National Castings Council. Several activities of the council were discussed.

The president reported that H. S. Colby, for the past four years executive vice president of the society, has resigned, and that John Harant, for the past year secretary-treasurer, was returning to private industry. He then introduced Lowell D. Ryan, the new managing director of the society. (Page 114)

During the year the board of directors of the society adopted a number of revisions in the bylaws, including the establishment of a three-man executive committee; the changing of the title of the executive officer of the society to Managing Director, and of the technical consultant to the Technical and Research Director; and permitting membership of Canadian foundries. All recommended changes were adopted unanimously by the membership at the meeting.

Prepare Moving Picture

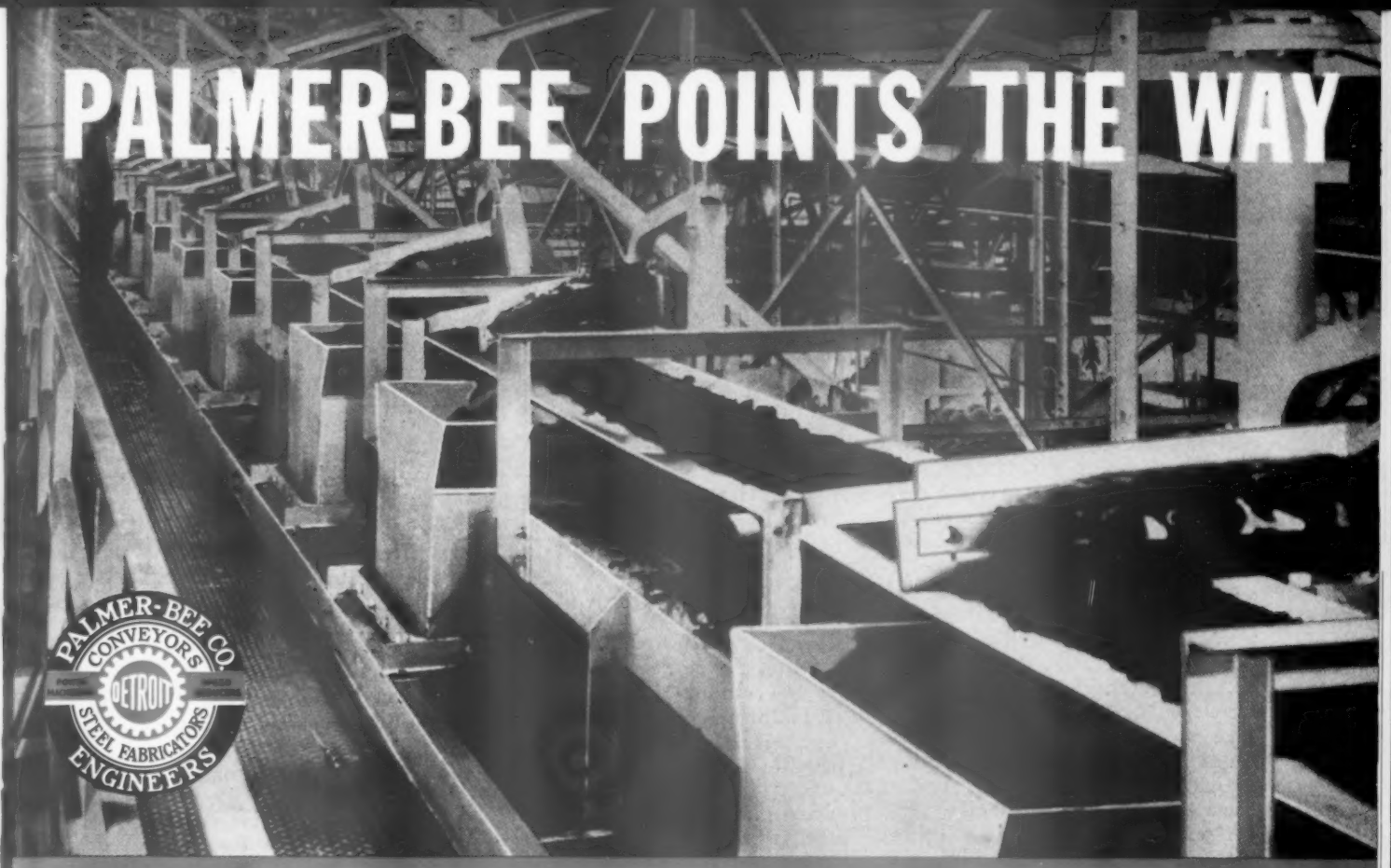
Frank O. Parker, Dayton Malleable Iron Co., Dayton, O., and chairman of the Committee on Publicity and Market Development, gave an interesting report on the work which is underway. Perhaps the most interesting activity of that committee at present relates to the production of a motion picture which tentatively has been titled "This Moving World." The picture will tell what the malleable industry makes, how it is made, and the applications and outstanding advantages of malleable iron castings. At present, the work of writing the script is in progress.

Mr. Parker suggested that the members of the society make greater use of "Malleable Iron Facts" in sales work. He stated that a study of back issues will provide information on practically every application of malleable iron. He reported that the society will continue to install cabinets featuring malleable iron in technical schools and colleges.

Frank E. Shumann, Lehigh Foundries Inc., Easton, Pa., and chairman of the Committee on Government Relations and Controls, reported on several recent developments of particular interest to the malleable industry. He discussed the work of

(*Concluded on page* 138)

PALMER-BEE POINTS THE WAY



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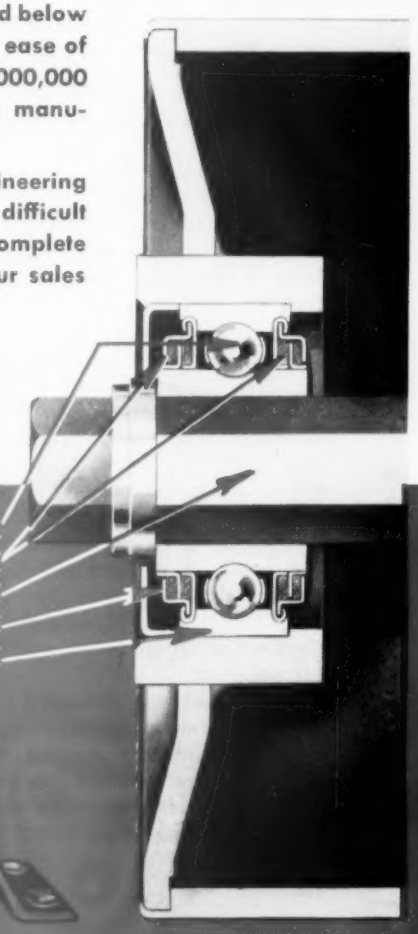
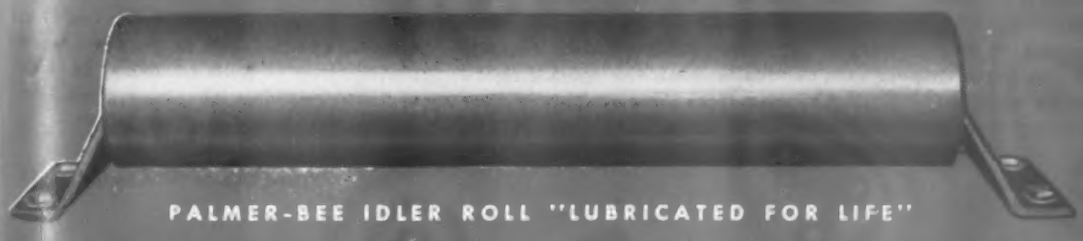

1 ONLY PRECISION BEARINGS ARE USED
2 DOUBLE SEALS ON BOTH SIDES OF BEARINGS
3 HEX BORE HOLDS INNER RACE FROM TURNING
4 METAL PARTS OF SEALS MADE OF STAINLESS STEEL
5 BALL RACES ARE RUST PROOFED



PALMER-BEE IDLER ROLL "LUBRICATED FOR LIFE"

(*Concluded from page* 136)
the society in preventing the adoption of allocations earlier in the year, but indicated that the group should be on guard to help stop new drives in that direction. He stated that production of malleable and foundry grades of iron was off 158,000 tons for the first four months, and that most of this was the malleable grade. Experts feel that if there is no coal strike, the loss may be made up by late fall.

Mr. Shumann reported on the recent meeting of the Iron and Steel Advisory Committee to the Military Establishment of which he is a committee member. That committee approved a proposal that a Castings Industry Advisory Committee be organized by the Munitions Board. Mr. Shumann indicated this committee would be organized with the co-operation of the National Castings Council. The speaker also referred to the recent publication of the Munitions Board, "Military Procurement, A Guide for Joint Industry-Military Procurement Planning," and advised each foundryman to obtain a copy. He pointed out that much of the planning for an emergency must be done by the individual company. The executives of each plant should initiate a study along the lines suggested in the previously mentioned publication, should check with its prime contractors, and should determine when the organization can best fit into the production picture.

Hear Committee Reports

The Friday morning session was devoted entirely to the reports of committees. G. J. Behrendt, managing director, Naugatuck Malleable Iron Works, Eastern Malleable Iron Co., Naugatuck, Conn., reported for the Committee on Plant Operations. John A. Wagner, Wagner Malleable Iron Co., Decatur, Ill., for the Committee on Cost Accounting; Harry M. Laws, New Haven Malleable Iron Co., New Haven, Conn., for the Committee on Membership; D. V. Walker, Eberhard Mfg. Co., Division of Eastern Malleable Iron Co., Cleveland, for the Committee on Programs; Frank S. O'Neil, Link-Belt Co., Indianapolis, for the Committee on Education, and Charles A. Gutenkunst Jr., Milwaukee Malleable & Grey Iron Works, Milwaukee, for the Committee on Research and Product Improvement.

Mr. Gutenkunst discussed the various shop practice meetings that have been held covering subjects of cleaning costs and the core department. He also discussed contacts with technical societies, engineering schools, and the work being done in the society laboratory.

George D. Branston, representative of the ferrous foundry group in a recent mission to Germany, presented a discussion on the future scrap situation. Mr. Branston indicated that while scrap is available, technicalities prevent most of it from reaching the United States. He also stated that practically every country in the world is short of scrap and that this complicates considerably the present situation.

SUBSTITUTE FUEL FOR CUPOLA USE

(*Continued from page* 75)
mersed in a well, built in the cupola spout, and response to the temperature of the molten metal was quite rapid—actually in about 30 seconds. Usually we obtained from six to eight readings before it was necessary to replace the outer protecting tube. At one time the thermocouple was immersed continuously in the molten iron for 2 hours.

We feel that the results obtained were entirely satisfactory and that this type of instrument is a valuable tool for accurate temperature measurement. It should be remembered that the temperature readings hereafter quoted were obtained by means of the Pt, Pt-Rh couple described.

Fluidity Measurement—In order to determine metal fluidity and to correlate it with metal temperature we designed a test which would reproduce as nearly as possible the casting of metal in a cast iron mold. This meant that a fluidity test mold would have to be constructed of cast iron to give relative results.

The mold used consisted of a series of 15-in.-long runs connected in series with a feeder gate and a riser. The design can best be noted by the sketch shown in Fig. 2 and by the cross section of the actual mold in Fig. 3. Fig. 1 shows an operator pouring metal into the top of this mold. The mold was maintained at a relatively uniform temperature by pouring several tests and then by keeping the mold closed. Consistent results were obtained by making tests at regular 15-minute intervals. The mold was carefully brushed after each test and a fresh coating of smoke applied by means of an acetylene generator. We realize that many factors influence metal fluidity but, for all practical purposes, in this particular unit the most important factor was temperature. The approximate range of temperature and fluidity obtained from a large number of tests are about as follows:

Length of Run in In.	Temp, °F
17½	2500
19½	2525
21	2550
22½	2575
24	2600
26	2625
27½	2650
29	2675
31	2700

The fluidity test indicated that, in this particular unit, fluidity readings ranging from 19½ to 26 in. gave satisfactory results. The temperature range with this range of fluidity was from 2525 to 2625° F. It was interesting to note that occasionally temperatures would be found as high as 2700° F. For this particular operation these temperatures were too high.

We are of the opinion that this type of fluidity test has considerable value and that it could be used successfully in other units.

Two-machine Operation — During the time the cupola was used for two-machine operation the ID was about 24 in. Nominally this size cupola (on a 6½ to 1 fuel ratio) is rated at 1.6 to 1.8 tons per hour. Actually it operated at a rate of from 2.2 to 2.5 tons per hour. As a result of this over capacity operation the blower, which was designed to deliver the required air at pressures of 20 oz, was working at top capacity—particularly when large percentages of anthracite were used. With good quality coke, pressures of 13 to 16 oz. were normally obtained and the blower capacity was sufficient.

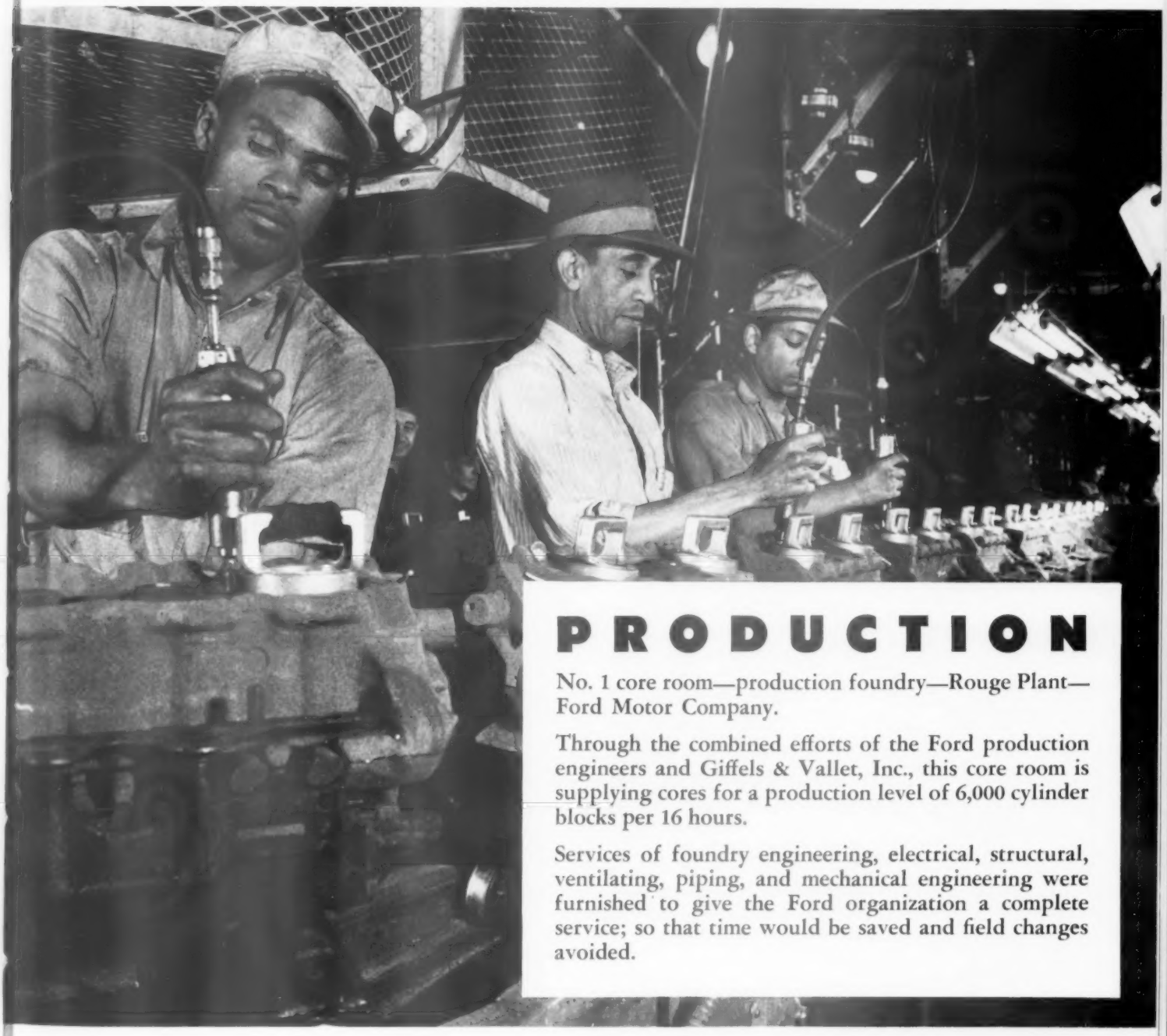
Considerable time was spent studying this factor of blower capacity and we came to the conclusion that a slight increase in cupola diameter (2-4-in.) would correct this trouble. We hope to investigate this point further. It is our belief that with this increase in diameter, the same volume of air would pass through the bed with lower wind box pressures and we would also expect to find lower melting rates per unit of cross section but with the same hourly tonnage.

We also spent considerable time studying bed height, which appears to be rather critical, and we hope to investigate more fully both of the last mentioned problems.

With the two-table operation, bed height was about 42 in. above the main row of tuyeres and the bed was always coke. Fuel ratios were varied from 6½/1 to 8/1. In this series of studies the best operation

(*Continued on page* 141)

ket cores being assembled on buggy conveyor. Component cores (Barrel, Shallow Jacket, Ports, and Deep Jacket) fitted and ground are delivered on monorail co
yors within easy reach of the mechanics. Cores are pasted and assembled on fixtures. Men in foreground are tightening clamping bolts which hold cores togeth



PRODUCTION

No. 1 core room—production foundry—Rouge Plant—Ford Motor Company.

Through the combined efforts of the Ford production engineers and Giffels & Vallet, Inc., this core room is supplying cores for a production level of 6,000 cylinder blocks per 16 hours.

Services of foundry engineering, electrical, structural, ventilating, piping, and mechanical engineering were furnished to give the Ford organization a complete service; so that time would be saved and field changes avoided.

GIFFELS & VALLET, INC.

INDUSTRIAL ENGINEERING DIVISION
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THIS MONTH, 62,562* BUYERS OF CASTINGS WILL READ THIS AD...

This is one of a series of 6 full page ads emphasizing the expanding industrial acceptance of Brass Castings. Nationally circulated in outstanding trade journals and read by manufacturers, engineers, contractors, metallurgists, production control men—*these messages reach the men who specify and influence the purchasing of castings!*

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DAIRY PLANT OPERATORS DEMAND....

Nickel Silver Castings for Appearance, Economy, Resistance to Corrosion

Pump casings, impellers, fittings and numerous parts for milk separators and sanitary pumps are cast in Nickel Silver. Users of Nickel Silver for these parts make this wise selection because they know that sanitation . . economy . . corrosion resistance and appearance are combined in this material. Many state food codes include Nickel Silver alloy requirements in those phases of food processing where these qualities are required . . for experience has proved that Nickel Silver castings reign supreme.

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REPRINTS OF ENTIRE *Brass Castings* SERIES ARE YOURS FOR THE ASKING

The Foundryman's Problems . . . Are Our Problems!

* Audited Circulation plus pass-on readership.

(*Continued from page* 138)

was found with 75 per cent anthracite in the charge, and the fuel that gave the best results was a broken size (3¼ x 4½-in., round-hole screen) equivalent to approximately 2½ x 3½-in., on square-hole screens. Several tests using 100 per cent anthracite were not entirely satisfactory, although on many occasions with this amount of anthracite in the charge we found operations perfectly normal for long periods. However, the limit of the blower capacity and the top operating pressures usually prevented long time operations with 100 per cent anthracite in the charge.

It is sufficient to say that, with two-table operation and with rather high fuel ratios, it was possible to operate consistently with 75 per cent of the charge consisting of anthracite. At times the limestone in the charge was increased from 12 to 17 lb and the added fluidity was of value in keeping the slags fluid.

Three-table Operation — With the adding of one more machine, the inside diameter of the cupola was increased to 30 in.

In all of this work one of the most disturbing factors has been the very poor quality of the coke, much of it being very small in size and with both sulphur and ash content much higher than found in anthracite. Whenever we could pick our coke size for a few days' operation, we found a remarkable (and not unexpected) difference in the way the cupola operated.

In this second series of tests anthracite was used in varying proportions up to 60 per cent of the charge with tonnage and temperature being satisfactory. Fuel ratios ranged from 9 to 10½/1 and tonnages produced were from 3.75 to 4 tons per hour as compared to a normal rating of a cupola of this size of 3.5 to 3.8 tons per hour at the ratios noted.

Suggestions for Use of Anthracite —In using anthracite as a fuel it seems particularly desirable to keep the bed as open as possible. This is always a desirable condition in cupola operation, but it is of particular value when using anthracite because we have found that with high percentages of anthracite in the charge (especially in this particular cupola) the pressures increase to the maximum of the blower capacity and wind volumes decrease. We believe that a slightly over-size cupola is the partial answer to this problem and we anticipated an opportunity of proving this at some later date.

In this unit (the permanent mold) which produces many castings of small size, and which uses in the metal charge a large percentage of the scrap castings, gates and risers produced, the charge density is high. When coke quality is poor it complicates the problems, and although coal size was satisfactory we encountered trouble from high pressures and low wind volume when we tried to use over 75 per cent anthracite in the charge.

As a help in keeping the charge open it is well to keep the tuyeres clean and open. With the type of tuyere cover which has a small opening and allows a small bar to be inserted, the tuyeres can be quickly cleaned.

Also of value is the use of greater than normal quantities of limestone in the charge. We have used up to 17 lb in each charge (about 7 per cent of the metallic charge). This gives more fluid slags and of course allows the slag to carry more sulphur due to the increased basicity and the greater slag volume. Sulpnur has not been a problem in this operation as an addition of sodium carbonate to the forehearth gives the necessary reduction.

There is also a possibility of the more basic slags (and lower FeO slags) being of value in reducing erosion of the cupola lining.

One of the most important factors encountered in this study was the importance of the careful handling of both coal and coke. In many of our experiments we forked the fuel by hand to eliminate fines. We believe that in most cases this extra cost was completely justified. To maintain the proper size of coal and coke it is important that they be handled in a manner such as to prevent breakage; with the present cost of fuel the expenditure of considerable amounts of money on handling equipment should prove of value in reducing overall costs.

Two 45-in. ID cupolas in this plant have been using from 50 to 60 per cent anthracite coal in the charge regularly. Temperatures in these units are just about the same as those obtained in the permanent mold unit and, as far as can be determined over a one-year operation, quality of the castings and temperature and fluidity of the metal have been entirely satisfactory.

A number of other plants in vari-

MOLD DRYING: Banks of 250-watt infrared lamps—248 in all—are used to dry molds and melt out 98 per cent of the wax pattern in investment casting molds at Westinghouse Electric Corp., East Pittsburgh, Pa. Balance of the wax is burned out in a preheat furnace where molds are heated prior to being poured

ous sections of the country have been using anthracite in varying percentages with satisfactory results.

The authors are indebted to the management of the Elmira Works, Apparatus Division, General Electric Co. for permission to publish these data.

MECHANIZATION FOR THE SMALL FOUNDRY

(*Continued from page* 73)

it is difficult to secure men. The vertical side-dump charger, of which more than 250 are in operation, is the lowest priced of any mechanical charging equipment. If properly handled, it will do a satisfactory job of charging the smaller cupolas, up to about 48-in ID, which corresponds to melting rates up to about 8 tons per hour. Prices for this type of charger range from about $2700 to $3500 depending upon the size of the cupola.

Larger cupolas should be charged with bottom discharge buckets having either cone-bottom or drop-bottom doors. Such buckets are used in connection with crane type chargers or heavier skip hoists which may serve from one to four cupolas.

Buckets used with the side-dump skip-hoist can be loaded with manual labor to make up charges, using wheelbarrows, balanced charging cars, or with a mono-rail having a suspended scale and drop bottom bucket to deliver material to the skip-hoist bucket. (See Fig. 1). With this last mentioned equipment (which costs about $3500) and a vertical skip hoist charger, two men can readily make up and charge 8 to 10 tons per hour. This usually means elimination of one to two men from the charging crew.

The necessity for a charging platform and an elevator is eliminated by the installation of a skip-hoist charger, which in most cases actually costs less money.

Melting Department—Cupolas melt over 95 per cent of all the cast iron made in this country. Cupolas are available with capacities from 1 to 30 tons per hour, and over 5000 are in use in the United States.

Many gray iron foundries melt the day's charge in 3 to 5 hours in the afternoon. In the mechanized foundries, molten metal is produced all day, and the hourly melting rate is adjusted according to the requirements of the molding floor. When iron is melted only in the afternoon, the molders stop work as soon as the blast is started and get ready to pour their floors. Many molders limit their day's production according to the amount of iron they are willing to carry and pour. Mechanized shops have organized pouring crews which do nothing but carry and pour iron. These men are less costly than molders.

If the tonnage for the day and the hours of operation are known, the size of the cupola can be accurately determined. If cupolas are operated more than 5 hours per day, it is desirable to install two cupolas for operation on alternate days. This eliminates night work and a hot, difficult job of patching the lining. If the cupola is operated only a few hours in the afternoon, the lining can be repaired next morning and ready for operation in the afternoon.

Cupola blowers are of the centrifugal and positive-impeller type, and each has advantages and disadvantages. Auxiliary equipment, such as air-weight control, dry blast and hot blast, is available and very important in many applications.

Ladles—U-shaped and cylindrical mixing ladles are being used in many foundries, even in those making light work and small tonnages. Their principal function is to equalize variations in the composition of the metal as it comes from the cupola and they may be used also to desulphurize the metal.

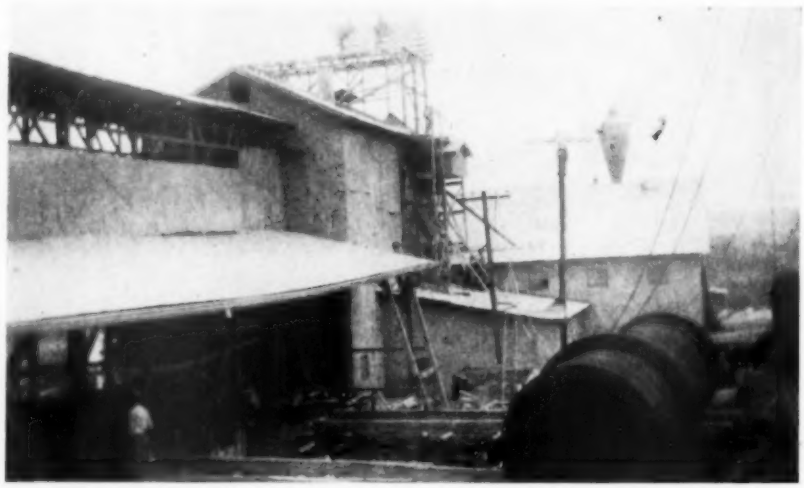
Mechanized shops distribute metal from the receiving ladle to smaller pouring ladles, which are often suspended on a monorail. Ladle handlers, (so-called one man pouring devices) are universally used in foundries making small and medium weight castings. Pouring ladles are of various shapes and sizes and usually are covered to conserve temperatures and to protect the men from the heat.

Shakeout Equipment—Shaking out, when done by hand, is one of the least attractive jobs in any foundry. Mechanical shakeout equipment confines this operation to one or two locations. The shakeout area can be hooded (Fig. 3) and steam, dust and fumes can be exhausted to a dust suppressor (Fig. 7) located outside the building.

Cleaning Department—This department should have a floor, and the equipment should be arranged for straight line flow with no back-tracking of work. Small castings should be handled on trays from operation to operation. Lift trucks are very useful in the cleaning department as well as elsewhere in the foundry. Good blasting, tumbling and grinding equipment is available, and all dust-making operations should be connected with an exhaust system to remove such material to collectors.

Centrifugal shot-blasting equipment is very popular and efficient. A unit equipped with a loader, which will clean 12 to 16 tons of miscellane-

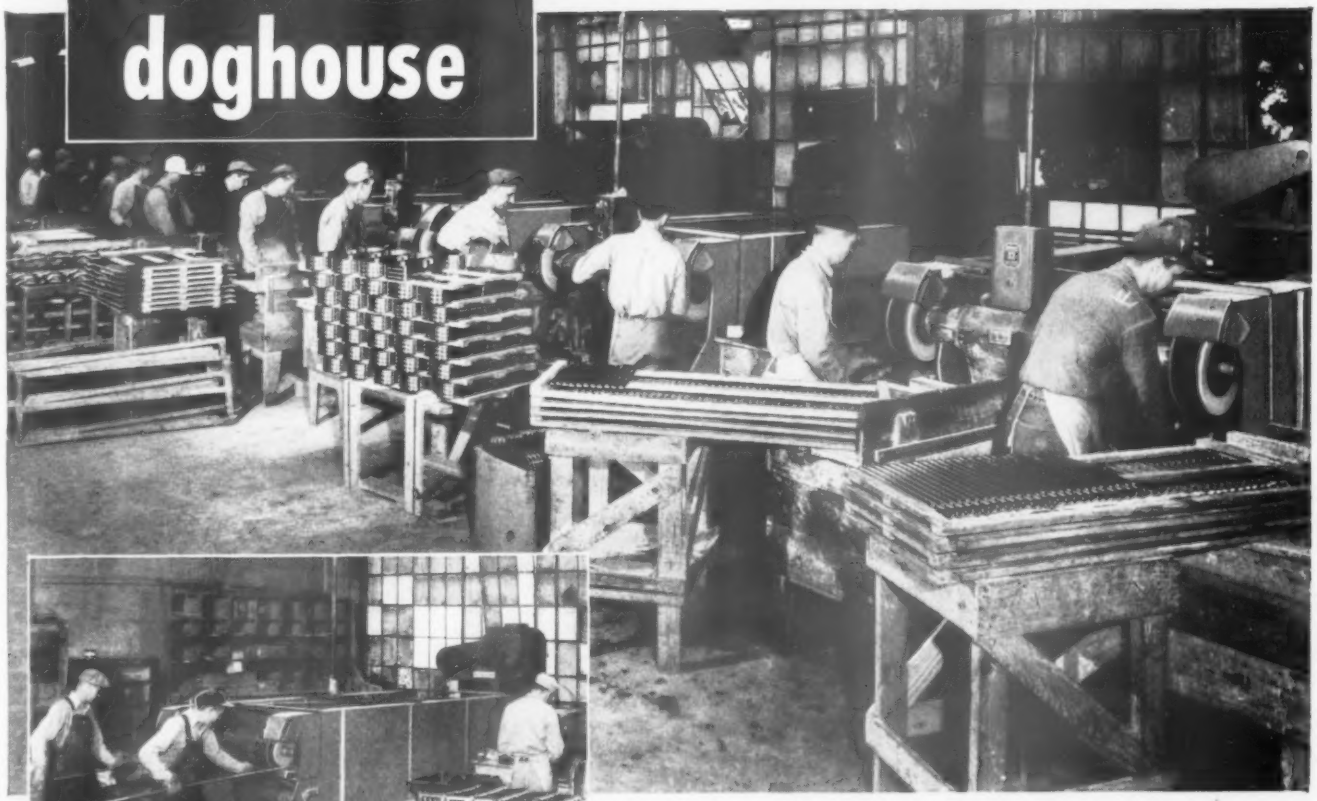
(*Continued on page* 145)



EXPANDED FACILITIES: American Colloid Co., Chicago, has expanded its Aberdeen, Miss., plant where southern bentonite is produced. A new rotary dryer has been installed to increase production and allow two distinct types of drying. Use of a new cylindrical gas-fired furnace which replaces the old box furnace is reported to provide more efficient firing and more uniform drying. Addition of a second roller mill will increase by 150 tons per day output of any desired mesh in grinding. In addition, American Colloid has increased its acreage of bentonite lands as a future reservoir for mining

dust is in the doghouse

MOULDING MANUFACTURER KEEPS DUST DOWN, PRODUCTION UP WITH KIRK & BLUM SYSTEM



Yes, dust is in the "doghouse", where it belongs, in this modern plant of Mouldings, Inc., Indianapolis, Ind. In buffing stainless steel mouldings for automobile manufacturers, a fibrous, greasy dust which is both a health and fire hazard is produced. "Doghouse"-type dust collecting hoods . . . equipped with unique foot operated work feed arrangement. . . are connected to the Kirk & Blum Dust Collecting System . . . pick up the dust as fast as formed and convey it to "Roto-Clones" which convert it to harmless, easily removed sludge.

This is another example of the many ways, in thousands of plants, that Kirk & Blum Engineers *clear the air for production.* And, as clear as the air, is the fact that, whatever your dust collecting problem, Kirk & Blum Representatives are ready to give expert, no-obligating advice. Write for Bulletin M, "Dust Collecting Systems in Metal Industries."

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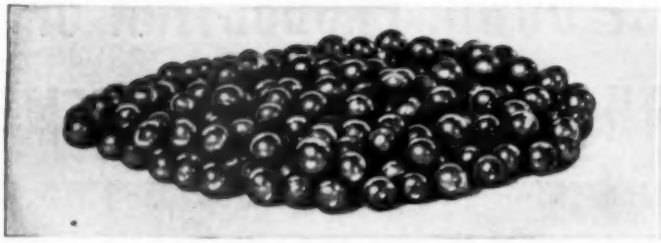
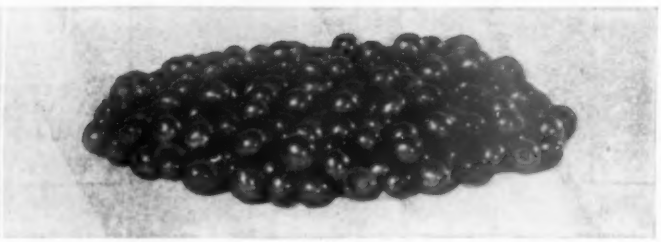
There is a *difference*

although they look alike!

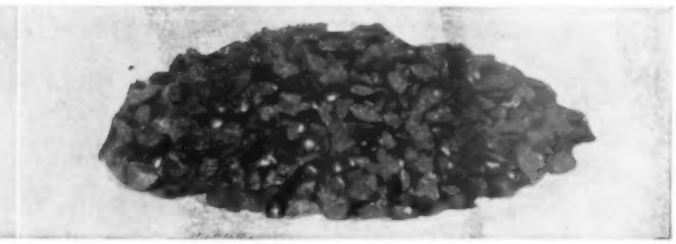


METAL BLAST ANNEALSHOT



ORDINARY SHOT

METAL BLAST GRIT



ORDINARY GRIT

ANNEALSHOT and GRIT are *tougher*

. . . because they are ANNEALED!

Here's why *annealed* shot and grit are better:

1. Tougher—outlast other shot and grit by 15%.
2. More efficient—for cleaning or peening.
3. Much easier on your equipment.
4. Less brittle—prevents pulverization.
5. Fast acting—better finish in less time.

ANNEALSHOT costs no more than ordinary shot and there's a size for every purpose. Your first order will convince you THERE'S A DIFFERENCE! Why not send for it today? You'll be back for more!

ANNEALSHOT by *Metal Blast*

Trade Mark Reg. U. S. Pat. Off.

METAL BLAST, INC.

872 EAST 67TH STREET • CLEVELAND 3, OHIO

(*Concluded from page* 142)

ous small castings in 8 hours, costs approximately $8000. Tumbling barrels, though not as much used as in the past, find application in many shops and are inexpensive in first cost and operation.

Miscellaneous — When mechanization is being considered there are many things to be taken into account besides the actual cost of the equipment. With the exception of very heavy work, practically any job can be rigged for machine molding. Rigging patterns for machine molding costs considerable money, and unless good rigging is provided, molding machines may not prove to be a particularly lucrative investment. In some cases the customer will furnish patterns with suitable rigging, but many customers will furnish a cheap wood pattern which can be used only for hand molding. A few foundries will mount a simple pattern for machine molding at their own expense if the order calls for 12 to 15 pieces, and if there is a good possibility for repeat orders.

When a foundry changes from hand to mechanized methods, the question of new piece rates immediately presents itself. The only sure way to avoid trouble is to be absolutely fair to all concerned—to the men, the customer and the company. Some shops have used the following formula for setting revised rates: 50 per cent of the production savings for the customer; 10 per cent of the production savings for depreciation reserve; 20 per cent of the production savings to the company for the risk involved in buying the machinery; 20 per cent to the men in the shop.

It may be advisable to set temporary rates until the new operation is fairly well established.

General—The first step in mechanizing operations is not mechanization at all. The first thing should be a grand cleanup program. This is not only for the benefit of the men, but also to insure decently clean working conditions for the new machinery. It will not operate with best results under dirty or dusty conditions. If such conditions prevail, maintenance costs are certain to be excessive.

Incidentally, the installation of machinery will require a better maintenance crew than many foundries are blessed with.

We suggest a general cleanup for the entire plant, inside and outside. The flask yard in many foundries needs a lot of attention. White paint on the walls and marked gangways have a wonderful psychological effect on the men. Clean windows cost money, but pay dividends in better castings. Also, it is somewhat embarrassing to have the big boss ask "What is your objection to daylight?"

Don't overlook the wash and locker rooms. Your men will feel better and look better getting on the street cars, and their wives will have a better opinion of the foundry business.

Conclusion—Can the small foundry afford to mechanize? Only the foundry itself can answer the question and decide how far it can afford to go.

In this article the attempt has been made to furnish some figures which will be of assistance in arriving at a conclusion. Some managements want to recover an investment in two years, some will go to as many as five. With unskilled labor at about $2000 per year, and skilled labor at higher figures, managements are sometimes willing to spend from $5000 to $10,000 for equipment which will eliminate one man from the payroll. Perhaps the $2000-a-year man costs twice that much if one figures the overhead, social security, insurance, supervision, retirement fund, etc.

In conclusion the author wishes to acknowledge his indebtedness for data, drawings and photographs used in the preparation of this article, which were furnished by the following companies: National Engineering Co.; International Molding Machine Co., American Wheelabrator & Equipment Co., and Allis-Chalmers Mfg. Co.

Electric Metal Guild Holds Meeting

The 16th annual meeting of the Electric Metal Makers Guild was held in Bethlehem, Pa., June 16 to 18. On the opening day of the meeting, Dr. C. H. Herty Jr., assistant to the vice president, Bethlehem Steel Co., addressed the joint technical session on the fundamentals in steel melting. The guest speaker on the following day was C. E. Sims, assistant director, Battelle Memorial Institute, whose subject was "Hydrogen and Nitrogen Contents of Steel." Another high light of the session was an open forum on the use of oxygen in electric furnace steel making.

The last day of the meeting was devoted to a visit to the Bethlehem plant of Bethlehem Steel Co. The following officers were elected for the coming year: President, A. J. Scheid Jr., Columbia Tool Steel Co., Chicago Heights, Ill.; vice president, F. O. Lemmon, Ohio Steel Foundry Co., Springfield, O.; secretary-treasurer, D. L. Clark, Simonds Saw & Steel Co., Lockport, N. Y.

Announces Training Conference

Purdue University, Lafayette, Ind., has announced a conference on industrial and business training, Sept. 29-30. Sponsored by the Purdue Technical Extension and the Division of Education and Applied Psychology, in co-operation with the American Society of Training Directors, and state training associations of Illinois, Indiana, Michigan, Ohio, Missouri and Wisconsin, the meeting will consist of work-shop sessions with panels of experts serving as discussion guides. Panel discussions will cover such topics as training of management and sales personnel, and general employee training for upgrading and adjustment. Registration fee for the two days will be $12.50.

Correction

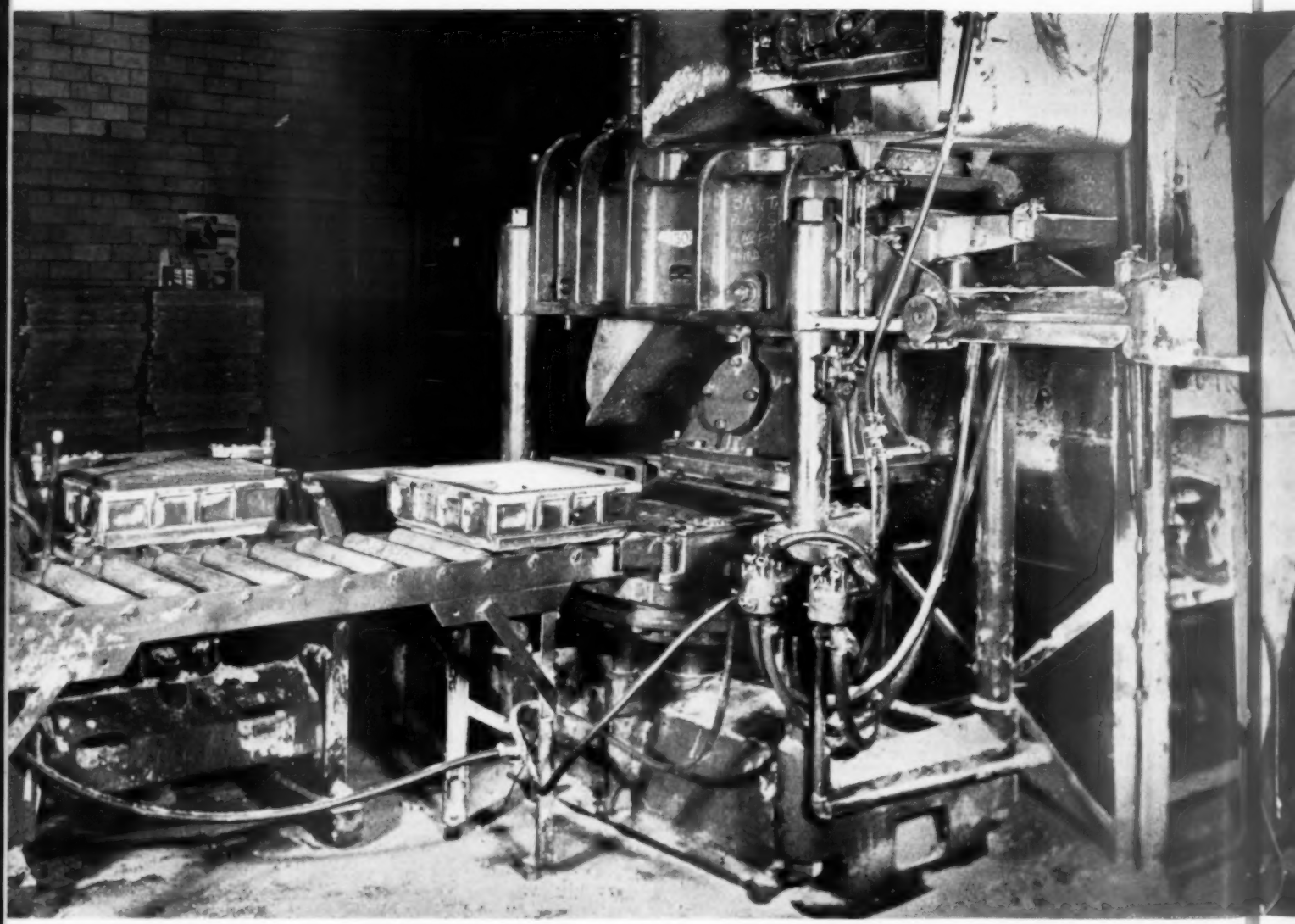
In reporting on the study of high temperature properties of steel molding sands at Cornell University (THE FOUNDRY for July, p. 128), it was stated that Prof. D. C. Williams inaugurated the work at Cornell and carried on the experiments in the early stages. Actually, the Cornell sand research program sponsored by the AFS Sand Division was inaugurated by H. L. York under the direction of Dr. H. Ries and the late Prof. A. C. Davis. Prof. Williams was research investigator on the project from Mar. 10, 1943, to June 30, 1947, and much of the data on properties of steel sand mixtures at elevated temperatures was obtained under his direction.

Book Review

Practical Job Evaluation, by Philip W. Jones, cloth, 304 pages, 5½ x 8½ in., published by John Wiley & Sons Inc., New York. Price $4.

This book is devoted almost entirely to the practical aspects of job evaluation. It is a detailed analysis of the subject by one who has been actively engaged in industrial relations at the working level. Emphasis has been placed on the design, installation and salesmanship of the procedures required to determine the wages of employees in industrial and business organizations.

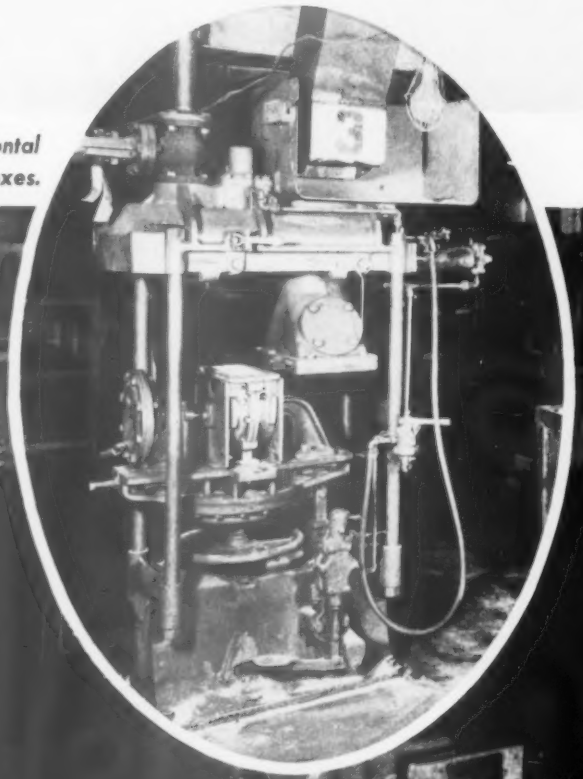
Cut core costs with OSBORN core blowing machines...



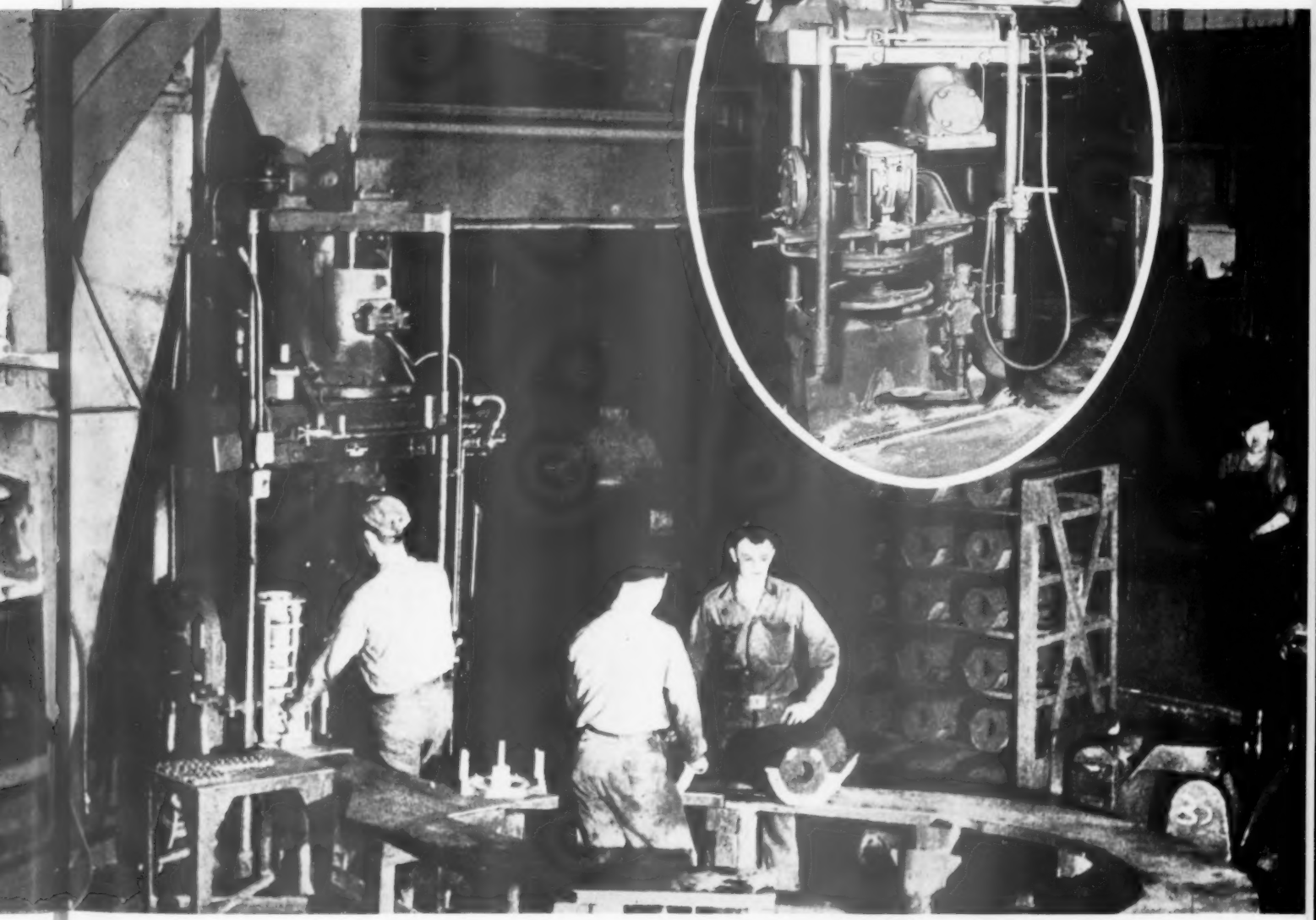
Osborn Core Blower with conveyor roller frame mounted on table.

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue Cleveland, Ohio

OSBORN Core Blowing Machines are made in both diaphragm and draw types in a wide range of sizes. Machines may be furnished with horizontal clamps for vertically split core boxes; conveyor roller frames mounted on the table for ease in handling large core boxes; automatic core sand feeder; and automatic operating valve if user's work requires. Sand reservoirs and blow plates are stocked for average foundry needs.



Osborn Core Blower showing horizontal clamps for vertically split core boxes.



Osborn Core Blower equipped with core sand feeder.

OSBORN

MOULDING MACHINES

CORE BLOWING MACHINES

MEMBER MANUFACTURER'S ASSOCIATION INC. FOUNDRY EQUIPMENT

Man-to-Man

ON THE MOLDER'S BENCH

"Foundrymen of Distinction"

By RALPH L. LEE

I SUPPOSE there are almost as many different ways and systems of storing patterns as there are people trying to do the job, and I expect there aren't very many among the latter who know as little about the subject as I do. But some time ago I met a fellow in charge of the pattern storage department of quite a good-size foundry who evidently had made a profession out of his job. In fact, the first place the general manager took me on our way through his foundry was the pattern storage department. He didn't have to tell me that it was one of the show places he was proud of.

At first glance the department looked to me to be just about the same as a lot of others I had seen except for top-notch orderliness and cleanliness. There wasn't one single pattern on the floor and there wasn't anything in the place except patterns. I don't think I'd be writing this story though, if good housekeeping was the only thing that struck me.

Draw Sketch on Card,

Right off the bat I noticed a drill press in the pattern department office. When I asked, "What in heaven's name do you need a drill press in here for?" the fellow in charge said, "I'll come to that later, but first let me show you our system of marking, identifying and finding patterns." I couldn't help but notice that he said "our" instead of "mine." He undoubtedly had some talent for drawing; anyway, on each pattern card in his file he had drawn a neat little sketch representing each of the patterns he had stored, with just enough detail to recognize the pattern it stood for but enough so there couldn't possibly be any mistake.

On the shelf where each pattern belonged was a copy of the sketch in the file. Both cards of course had all of the other necessary information. Joe was like a mother cat with kittens as he was showing me the lay of the land. He said they had quite a few people around the place who could hardly speak English, let alone read it, so when he saw a vacant spot on his shelves that should have had a pattern in it he looked at the sketch, dug up the corresponding card in his file and went on out into the plant sleuthing. Instead of wrestling English he flashed his picture card and in short order the other fellow settled the matter with, "Shoor Joe it's dere."

I haven't had enough experience in the foundry business to even judge whether this pattern storage man had done anything so outstanding or not, although his system looked darned good to me. But the way this fellow had taken hold of a job he didn't know anything about, got interested in it and licked it to a point where his top people took pride in what he had done is, I'm sure, something worth writing home about.

Joe had been a guard on the front gate, so his manager told me. They had been having one heck of a time trying to find patterns. Most of the time the production boys would have to come into the department and lose time fiddling around looking for what they needed. The fellow then in charge felt he was considerably overworked and was inclined to meet most of his customers as though they were pests.

On the other hand, Joe meets his customers as though they were really customers, with sort of a professional gleam in the old eye. None of them has to roam around looking for what he wants, for Joe knows definitely where to lay his hands on it. Neither Joe nor his boss had to tell me that Joe gets a bang out of his work, that he is proud of it and that down inside he knows he is largely responsible for making his job what it is today.

Maybe I'm making a mountain out of a mole-hill but I don't think so. There is no reason in the world why each bottleneck job in any foundry can't offer some individual a chance to distinguish himself, to make a name for himself among his fellows and yes! even among outsiders who come in to visit.

Find Man Like Joe

Of course this can't be done by an individual all by himself. Those running the outfit have got to look upon each link in the production or business chain as the neck to the bottle and respect it as such. It might be asking too much to expect every one of these bottlenecks to be manned by a fellow determined to distinguish himself, but on the other hand it certainly won't do any harm to keep that possibility in the back of our minds and to be continually on the lookout among the boys in the plant for raw material like Joe.

By the way, I almost forgot, the drill press in Joe's little office was used to drill holes through certain loose pattern parts so they could be wired together to keep them from getting lost.

When I got home from this particular trip I told Mother (my better half) about the sketch idea. "Say Dad!" she said, "why don't we use that system for our garden tools?" We did, it works swell, in fact, nothing's been lost, for long, since.

I'll go on record as saying that as far as I'm concerned Joe the Pattern Man is one of the most successful people I have ever met and regardless of profession.

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TRUSCOR (light weight) or AMERIKOR (heavy weight) Cereal Binder added to the core sand mix does a lot for core quality. It increases the affinity between individual sand grains before baking. This means greater green strength . . . more accurate cores.

The same qualities that bond sand grains together, prevent their adhering to the pattern, resulting in sharper — cleaner cores, thus better castings. Moreover, finely divided cereal binder adds a definite character to the mixture for a better surface finish.

Because cereal binder burns out rapidly and completely, there is easy and complete collapsibility.

For better, lower-cost cores, place a trial order for Krause Cereal Binders now — TRUSCOR, if you like a light weight binder; AMERIKOR, if you prefer a heavier weight.

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ACTIVITIES OF FOUNDRY *Groups*

Central Michigan

CENTRAL Michigan Chapter of the AFS in a meeting at the Schuler Hotel, Marshall, Mich., May 28, nominated the following slate of officers and directors for 1948-49:

C. C. Sigerfoos, Michigan State College, East Lansing, Mich., chairman; F. Coghlin Jr., Albion Malleable Iron Co., Albion, Mich., vice chairman, and George Petredean, Calhoun Foundry Co. Inc., Homer, Mich., secretary-treasurer.

Directors are: Jack F. Secor, Hill & Griffith Co., Niles, Mich.; Collins Carter, Albion Malleable Iron Co., and Clare Dock, Dock Foundry Co., Three Rivers, Mich.

The technical paper of the evening, entitled "Casting Defects and Their Remedies," was presented by Harry W. Dietert, president, Harry W. Dietert Co., Detroit. Mr. Dietert first covered casting defects caused by loose sand in the mold and metal penetration. Regarding the penetration defect, it was pointed out that the common causes of this defect are soft ramming, pouring too hot or using a sand having too high permeability.

Mr. Dietert then described the causes and remedies of rat-tail defects. The cause of this defect is usually a molding sand having a combination of high flowability, high hot strength and high expansion properties. Remedies for rat-tailing include the use of a proper amount of combustible binder in the sand, softer ramming and control of the hot strength and expansion properties of the sand.

In conclusion, Mr. Dietert presented a motion picture that he had taken in his laboratory. This film illustrated how the surface condition of a casting can be affected by the mold atmosphere when the latter is changed by adding chemical compounds to the sand or by piping gas into the molding during pouring.—*C. C. Sigerfoos, Michigan State College.*

APPRENTICE WINNERS: Three Cleveland winners in the national AFS apprentice contest who received their prizes at a recent meeting of Northeastern Ohio Chapter. Left to right: John Coreno, Hill Acme Co., second prize, gray iron; Frank Alabaise, West Steel Casting Co., third prize, steel; John Valichnac, Fulton Foundry & Machine Co., third prize, gray iron

Texas

W. W. LEVI, metallurgist, Lynchburg Foundry Co., Radford, Va., spoke at the May meeting of Texas Chapter of the AFS on the subject of cupola operation and carbon control.

Mr. Levi recommended the use of kindling tuyeres and a layer of flux on the cupola bed to insure hot iron at the start of a heat. Limestone and fused soda ash on the bed provide a fluid slag which will start running soon after tapping out.

He went on to say that carbon in the charge is most important and should be calculated from the weighed and previously analyzed materials which make up the charge. The carbon in the iron at the spout should be subjected to chemical analysis. In addition to being affected by the ingredients of the charge, the carbon at the spout is affected by the amount and type of coke in the bed and between charges and by the melting rate and temperature of the blast.

He concluded by saying that the moisture content of the air in the blast affects the temperature of the blast which in turn results in a bath temperature difference.

Officers elected at the June meeting for 1948-49 are: Jake Dee, Dee Brass Foundry, Houston, Tex., chairman; C. W. Williamson, Trinity Valley Iron & Steel Co., Fort Worth, Tex., vice chairman; P. B. Croom, Houston Pattern Works, Houston, secretary, and Edward Wey, Dee Brass Foundry, treasurer.

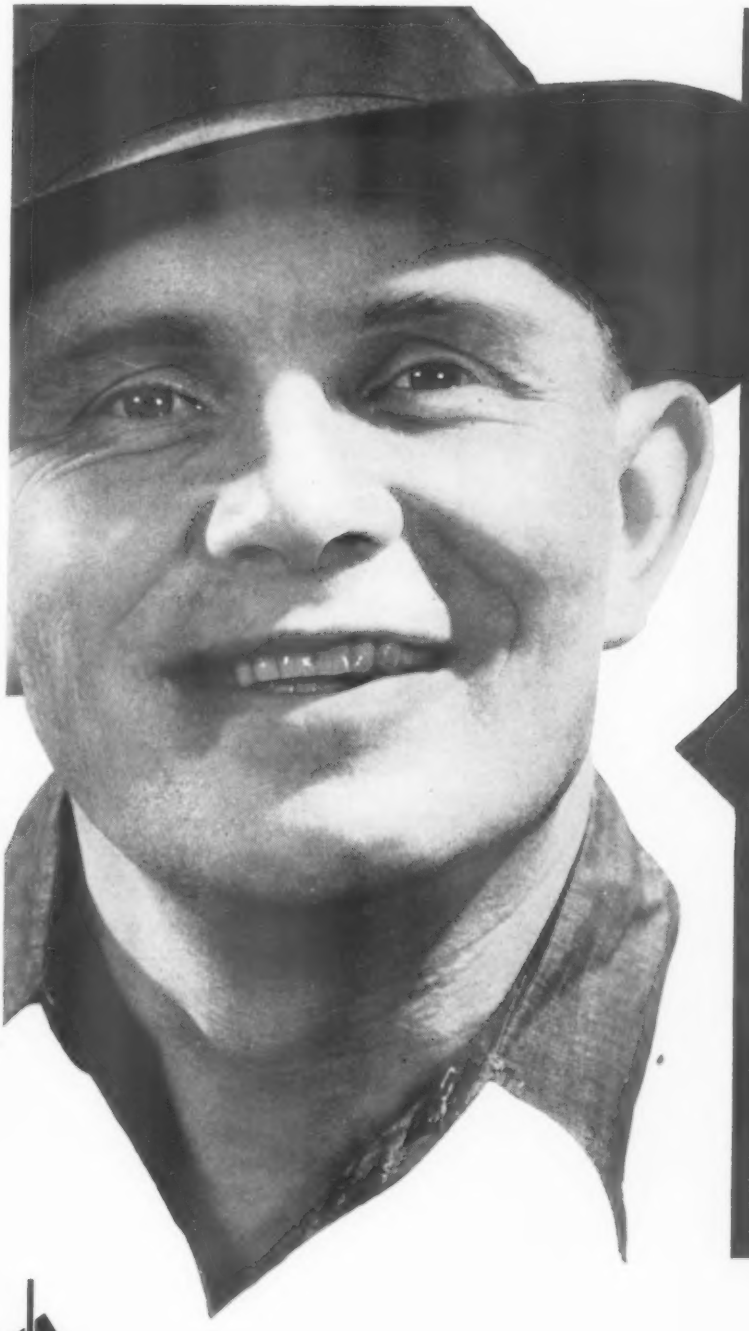
Directors are: Malcolm Henley, Texas Foundries Inc., Lufkin, Tex.; Ferrell Huber, Able Supply Co., Houston; Thurman Killman, Texas Steel Co., Fort Worth, and W. H. Lyne, Hughes Tool Co., Houston.—*W. H. Lyne, Hughes Tool Co.*

Southern California

CHAPTER officers nominated in May by Southern California Chapter of the AFS are: L. O. Hofstetter, Brumley-Donaldson Co., Los Angeles, president; Earle D. Shomaker, Kay-Brunner Steel Products Inc., Alhambra, Calif., vice president; John E. Wilson, Climax Molybdenum Co., secretary, and Henry W. Howell, Howell Foundry Co. Inc., Los Nietos, Calif., treasurer.

Named directors for two years were: James H. DeWald, Bell Foundry Co., South Gate, Calif.; John J. Derkin, Los Angeles Steel Casting Co. Ltd.; Donald A. Eggleston, Ace Foundry Ltd., Huntington Park,

(*Continued on page* 152)



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SOUTHERN CALIFORNIA Chapter of the AFS celebrated its annual Ladies' Night with a dinner-dance at Royal Palms Hotel, Los Angeles, Apr. 24. Views of some of the seventy couples who attended are shown above

(*Continued from page* 150)

Calif., and Robert Coulson, Kaiser Co. Inc.

Dr. James T. MacKenzie, technical director, American Cast Iron Pipe Co., Birmingham, Ala., was the technical speaker for the evening, discussing cupola practice. His principal conclusions might be summed up in the statement that foundrymen should know how cupolas are made and the "whys" of design if they are to get the most out of them.

President Hal Russill, Eld Metal Co. Ltd., Los Angeles, announced formation of "smog" committees in the various foundry divisions. Chairman of the gray iron committee is Earle V. Grover, Apex Steel Corp.; A. L. Goodreau, G-B Brass & Aluminum Co., is chairman of the nonferrous committee, and C. B. Tibbetts, Los Angeles Steel Casting Co. Ltd., is chairman of the steel committee.

AFA Changes Name

American Foundrymen's Association has voted to change its name to the American Foundrymen's Society, effective July 1 this year. The change was approved by the membership in a general revision of the by-laws. Reasons given for the change are that it is more descriptive of the organization's functions, and that it conforms to the general practice in the names of other large technical and scientific groups.

Other amendments to the by-laws provide more fully for the organization and administration of the 44 chapters and the various society sections, such as divisions, general interest groups and projects, and for the financing and direction of research activities.

Ira Morgan White, chief engineer, Pelton Water Wheel Co., San Francisco, at the June meeting of Southern California Chapter told about the large units his company is building for use at Grand Coulee Dam. These are said to be the world's largest hydraulic turbines and there will be 12 of them when Grand Coulee is finished.

Standards imposed on construction of the turbines allow for only three-fourths of 1 per cent variation in factors of efficiency as laid down by the United States Bureau of Reclamation. In many cases, according to Mr. White, foundry facilities have been instrumental in dictating the type of design that has been employed for the equipment.

(*Continued on page* 155)

Built for the Foundry by Foundrymen!

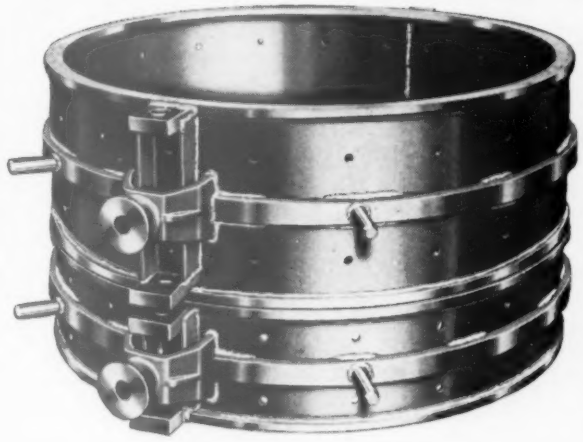
BS & B
WELDED STEEL
FOUNDRY FLASKS

All along the production line of the vast Black, Sivalls & Bryson plant, the master hand and eye of the experienced foundryman has control. Your foundry flasks are precision tools, and B S & B craftsmen and modern facilities make them so. Huge forming presses shape the steel exactly as required in your specifications.

Welders with the finest electric arcs produce welds as strong as the metal itself. Yet B S & B Flasks are lighter, easier to handle. Hydraulic presses remove any distortion, make drag and cope perfectly true. Both parting line and strike-off side of each section are carefully ground to provide a tight, level joint between sections.

Twin drills place pin lugs with meticulous care. Inspections are made after each step, and only the perfect flask gets through.

Investigate for yourself the distinct advantages of B S & B Welded Steel Foundry Flasks. Call your nearest distributor, or write today for complete information.



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25 billions...

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This great industry, comprising some 2500 individual foundries, supplies vital parts for virtually every metalworking industry in the country.

The members of Gray Iron Founders' Society, producing nearly 75 per cent of this total volume, have launched a forward-looking program for the mutual benefit of users and producers of gray iron components.

"MAKE IT BETTER WITH GRAY IRON"

Prime Objectives of This Program Are:

1. To assist users and potential users of gray iron in making their products better, or lowering their costs, or both.
2. To help members of Gray Iron Founders' Society improve their products and processes, by means of consultation and service.
3. To promote education on the uses and advantages of gray iron components—within the membership, in technical schools and throughout industry as a whole.

Gray Irons Provide These Advantages:

1. Machinability
2. Corrosion resistance
3. Damping capacity
4. Abrasion and wear resistance
5. Rigidity
6. Heat resistance
7. Low notch sensitivity
8. Durability
9. Castability—dimensional accuracy
10. Wide selection of mechanical properties

GRAY IRON FOUNDERS' SOCIETY, INC.

GRAY IRON FOUNDERS' SOCIETY, INC. 33 PUBLIC SQUARE CLEVELAND 13, OHIO

(*Continued from page* 152)

Officers and directors nominated in May took office at this meeting, and Mr. Russill, retiring president, was awarded a diamond ring in appreciation of his services during the season just ended.—*Maurice Beam.*

Tri-State

TRI-STATE Chapter of the AFS held its final dinner meeting of the season May 21 with twenty members present. Results of the election of officers and directors were announced. They are:

Dale Hall, Oklahoma Steel Castings Co., Tulsa, Okla., chairman; C. A. McNamara Jr., Big Four Foundry Inc., Tulsa, vice chairman; Dan Mitchell, Progressive Brass Mfg. Co., Tulsa, secretary, and Robert Timberlake, Metal Goods Corp., Tulsa, treasurer.

Directors for three years are: Clyde Beagle, Webb Corp., Webb City, Mo., and James Winger, Tulsa Iron Works Co., Tulsa.

Nathan Janco, president, Centrifugal Casting Machine Co., Tulsa, spoke on "Centrifugal Casting" and his address was followed by an interesting discussion period led by Dale Hall, retiring program committee chairman.

The chapter held its annual stag party at Veteran's Hut, Tulsa, June 18 with 115 members and guests present. A buffet dinner was served and entertainment was arranged by M. C. Helander, entertainment committee chairman.

Incoming officers and directors were introduced from the speakers' table by R. W. Trimble, Bethlehem Supply Co., retiring chairman.—*R. W. Trimble, Bethlehem Supply Co.*

Tennessee

NINETY-TWO members and guests attended the first annual business meeting of Tennessee Chapter of the AFS at Patten Hotel, Chattanooga, Tenn., May 28.

Officers elected for 1948-49 are: G. Frank Anderson, Chattanooga Implement & Mfg. Co., chairman; Charles Saunders, Tennessee Products & Chemical Corp., vice chairman, and A. D. Willis, U. S. Pipe & Foundry Co., secretary-treasurer. All are from Chattanooga.

Directors for one year include Ormand Corry, Harrison-Corry Co., Knoxville, Tenn. ...l other directors are from Chattanooga. They are: For one year—Lester Bealer, American Brake Shoe Co.; Paul Stuff, Ross-Meehan Foundries, and Carter Paden, Moccasin Bushing Co. For two years—W. C. Cate, Crane Co., and William P. Delaney Sr., Eureka Foundry Co. For three years—Karl Landgrebe, Wheland Co., and P. L. Arnold, U. S. Pipe & Foundry Co.

S. C. Massari, AFS technical director, presented the group with the famous cast iron rattle signifying that the Tennessee Chapter has been recognized officially as an integral part of the national association. Mr. Massari gave an interesting coffee talk on the responsibilities of the new chapter.

L. D. Pridmore, International Molding Co., was technical speaker of the evening and talked on "Molding Machine and Core Blowing Prac-

(*Continued on page* 160)

NORTHEASTERN OHIO: Some of those who attended Old Timers Night held by Northeastern Ohio Chapter of the AFS May 13 at the Cleveland Club, Cleveland. Photos by Stanley Kuznik, National Malleable & Steel Castings Co.

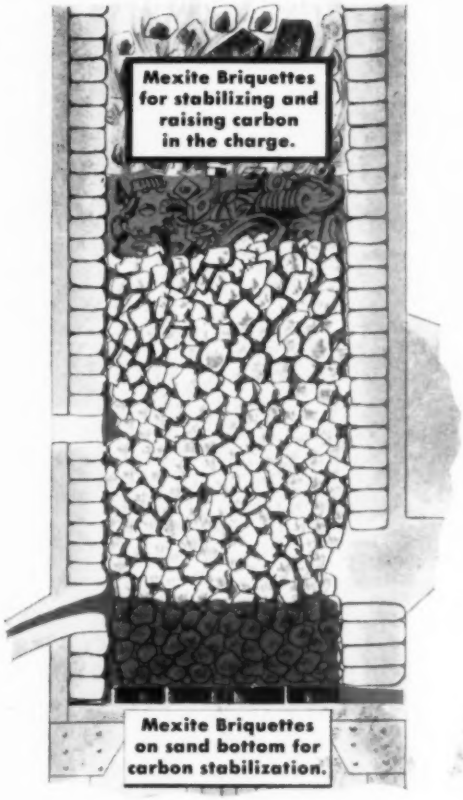
MEXITE BRIQUETTES LICK PIG IRON SHORTAGE IN EASTERN FOUNDRY

The Eastern Foundry Company Uses Mexite Briquettes and No. 8 Mexican Graphite to Produce Better Quality Castings at Lower Cost.

Pig iron shortages don't worry The Eastern Foundry Company of Boyertown, Pa. They use Mexite Briquettes in their cupola charges — 4 Briquettes per 2,000 lb. charge with 25% pig iron — and they're getting better carbon control and more fluid iron than before. That's because *one 4-lb. Briquette yields as much carbon as 50 lbs. of pig iron,* and also improves fluidity, cuts shrinkage and chill, and greatly aids melting. Because of these advantages, the foundry plans to increase the number of Mexite Briquettes per charge and reduce the pig iron content to 15% while still maintaining the proper carbon balance between 3.35 and 3.45%.

In addition to Mexite Briquettes, Eastern Foundry uses No. 8 Mexican Graphite as *a low-cost ladle addition* to give exact con-

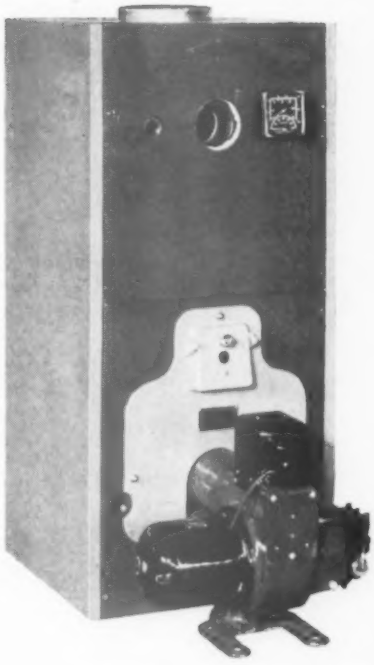
Mexite Briquettes are easy to use by simply tossing into the charging door.


Mexite Briquettes for stabilizing and raising carbon in the charge.
Mexite Briquettes on sand bottom for carbon stabilization.

THE UNITED STATES GRAPHITE

trol of chill and assure castings of increased machinability.

The experience of Eastern Foundry with Mexite Briquettes and No. 8 Mexican Graphite is not unusual. Foundries everywhere *are lowering costs and improving the quality of their castings* with these and other of our Mexican Graphite products for foundry use. We will be glad to analyze your charging and melting problems and recommend the specific products that will give you better results for less money. *Write for complete particulars.*



Peerless boiler having cast sections which demand close carbon control — one of the products of Eastern Foundry.

THE EASTERN FOUNDRY COMPANY

"EAFCO" SOIL PIPE & FITTINGS, PLUMBING SPECIALS & CASTINGS, "PEERLESS" COAL, GAS, OIL STOKER & WATER SUPPLY BOILERS

BOYERTOWN, PA.

November 25, 1947

The United States Graphite Company
Saginaw, Michigan

Gentlemen:

We want you to know how pleased we are about your Mexite Briquettes for carbon control in our cupola. When pig iron became hard to get, we were worried about maintaining the accurate carbon control of the high quality castings which we demand to insure production of the pig iron shortages. Your product has After using your Mexite Briquettes for several months we are no longer concerned about pig iron shortages. Your product has enabled us to maintain even better carbon control and more fluid iron.

We are enclosing a picture of one of our products, the Peerless Boiler, having cast sections which demand close carbon control. We also make soil pipe and fittings, sheaves, etc., and the iron must be fluid to run into these sections properly. We use 4 Mexite Briquettes per 2,000 pound charge with 25% pig iron, and are planning to reduce the pig iron to 15% and use more Mexite to maintain the proper carbon balance which we hold between 3.35 and 3.45% C.

For years we have used your No. 8 Mexican Graphite as a graphitizing ladle inoculant and wouldn't be without it to reduce chill and hardness, and improve machinability.

We pour about 70 tons of iron per day in our foundry. Your Mexite Briquettes should prove a valuable aid to any foundry, especially during these times when carbon control and carbon raising must be accomplished with less pig iron.

Yours very truly,

Dan Eckert, President
THE EASTERN FOUNDRY COMPANY
Boyertown, Penna.

DGE:HR

Mexite Briquettes, analyzing 70% Mexican Graphite, are 8" x 4" x 2" and weigh approximately 4 lbs. each.

COMPANY • SAGINAW, MICHIGAN

NEW ENGLAND Foundrymen's Association held its summer outing June 9 at Pawtucket Golf Club, Pawtucket, R. I. Photos of the outing are by C. A. Wyatt, Debevoise-Anderson Co., Boston

Sterling

"THE WHEELS OF INDUSTRY"

SNAGGING is a "daily grind" that is made easier and quicker by using Sterling's Vitrified or Resinoid Grinding Wheels, especially developed for the job they are to do. For cool operation and faster metal removal, they are ideal because they are built to job-tested formulas for all types of mills and foundries.

What's your problem—casting cleaning, billet grinding, snagging large or small pieces? Whatever it is, there is a Sterling Grinding Wheel built especially to end your grinding worries.

A consultation with a Sterling engineer in your plant . . . right on the job . . . will do much to eliminate trouble-some delays, operator fatigue, and slowed-up schedules. Write today.

The Sterling Specification Selector lists all types of wheels for foundry and steel mill grinding. Send for it now!

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

(*Continued from page* 155)

tice." His address was supplemented with slides illustrating fundamentals of his talk and showed the components necessary to perform blowing operations efficiently.—*A. D. Willis, U. S. Pipe & Foundry Co.*

Central Indiana

OFFICERS for the 1948-49 term, elected by Central Indiana Chapter of the AFS at its final meeting of the season, held in the Athenaeum, Indianapolis, Ind., May 24, are:

Chairman, Robert Langsenkamp, Langsenkamp-Wheeler Brass Works, Indianapolis; vice chairman; Howard Creps, Frank Foundries Corp., Muncie, Ind.; secretary, Jack Giddens, International Harvester Co., Indianapolis; treasurer, Paul Faulk, Electric Steel Castings Co., Indianapolis. Messrs. Giddens and Faulk were re-elected to their respective offices.

New chapter directors elected are Carl O. Schopp, Link-Belt Co., Indianapolis; Paul Hargett, Light Metals Inc., Indianapolis; Franklin Swain, Golden Foundry Co., Columbus, Ind.; William B. Ziegelmueller, Electric Steel Castings Co., Indianapolis, Fred Carl, Central Foundry Division, General Motors Corp., Danville, Ill., and William K. Mitchell, L. W. & W. K. Mitchell Co., Indianapolis.

Guest speaker at the meeting was Ralph L. Lee, General Motors Corp., who spoke on "Production Rhythm —Man to Man." Mr. Lee made a strong plea for greater understanding between management and labor in the foundry industry. He pointed out that too often the executive is prone to forget the difficulties and problems encountered by the molder. He urged that every foundry executive spend more time in the foundry and that stronger incentives be offered the foundry worker in order to get improved production from him.

Mr. Lee made it clear that unless the foundry worker is taken into the confidence of management and shown the goal for which he is striving and the finished job on which he is working, he cannot be expected to take much interest in his job nor to produce at capacity.

William B. Ziegelmueller, retiring chapter chairman, pointed out that the Central Indiana Chapter now is the 14th largest in the country. He reviewed progress of the chapter from its beginning in 1939, with a membership of only 40, to its present membership of approximately 275 foundrymen.

Special tribute was paid to all past chapter chairmen, five of whom were present.

Approximately 200 Indiana foundrymen attended the meeting and dinner, which will be the last until September, when the annual stag picnic will be held.—*William K. Mitchell.*

CENTRAL INDIANA Chapter of the AFS met in Indianapolis, May 24, for its final meeting of the season. Ralph L. Lee, public relations department, General Motors Corp., (left) was guest speaker for the evening and spoke on "Production Rhythm—Man to Man." Center photo is a view of the speakers' table and part of the members present at the meeting. At bottom is a view of the special table for past chairmen, five of whom were present. Photos by courtesy of staff photographer, International Harvester Co.

Central Illinois

SECOND Annual Clambake Stag of Central Illinois Chapter of the AFS was held June 12 at Keenland Park, near Peoria, Ill. Approximately 250 members and guests enjoyed the clams, chicken and the usual trimmings.

A blind bogey golf tournament was held in the morning with prizes being awarded 12 winners. Most of the afternoon was spent playing soft ball and pitching horseshoes, and there was the usual renewing of acquaintances which is always prevalent at such gatherings.—*Vern W. Swango, Caterpillar Tractor Co.*

Ontario

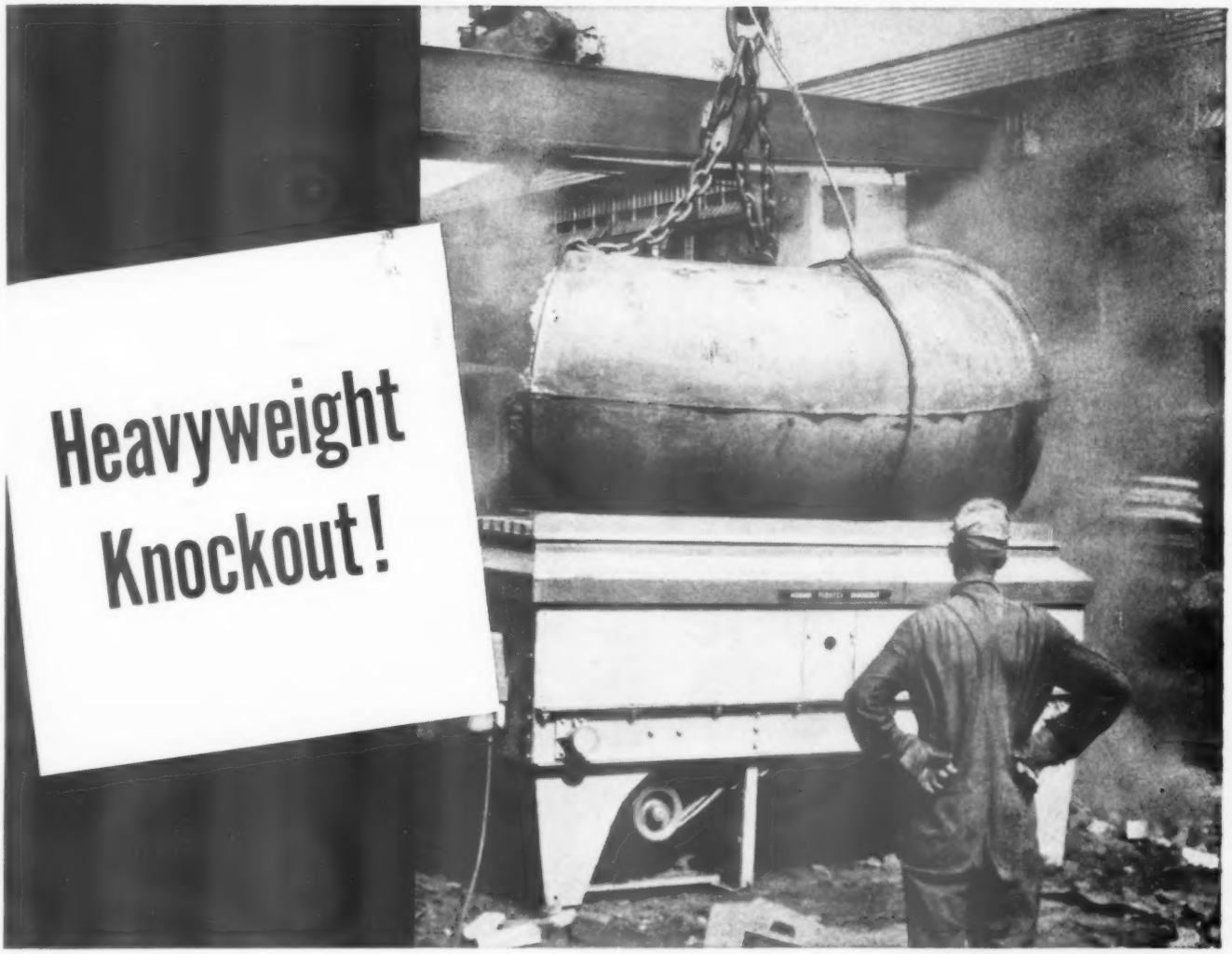
A JOINT meeting of the directors and program committee of Ontario Chapter was held in the Royal York Hotel, Toronto, July 6, under the chairmanship of Russell A. Woods, George F. Pettinos Co., Hamilton.

Mr. Woods and Jack King, Werner G. Smith Co., Toronto, vice chairman of Ontario Chapter, reported in detail on information, instructions and suggestions received at the chapter chairmen's meeting recently held in Chicago. This meeting was a real inspiration and will be of great value to our representatives as well as the Ontario Chapter.

T. Davies, Canada Metal Co., Toronto, was appointed publicity chairman of the chapter to better publicize our meetings, the speakers and their topics to the membership.

The program for the coming year, including meeting chairmen, speakers, and topics was thoroughly discussed and an interesting and instructive season is assured. The first meeting will be held in Hamilton, on Sept. 17, and the subject of foremen

(*Continued on page* 163)



Versatile Robins Floatex Shakeout knocks out huge elbow . . . in jig-time

It takes a lot of power to shake out and knock out the big fellows. And the Robins Floatex Shakeout has what it takes to do *both* jobs.

In one day, for example, a Robins Portable Floatex Shakeout completely knocked out the cores from nine huge castings. Only two men plus the crane operator were needed. It would require ten men—using pneumatic breakers, chisels and sledges—to match this performance.

What's more, this gruelling test was conducted on a *standard* Robins Portable Floatex Shakeout! The Floatex was not altered in any way. It was not strengthened in any part. It was not equipped with any special base or foundation.

That's not all! When the test was completed, not a trace of damage could be found—in springs, bearings, shaft, live frame . . . *anywhere*. Yet the Floatex had knocked out the cores from nine huge castings weighing from 12 to 17 tons each. And it had done so in as little as 17 seconds . . . no longer than 17 minutes!

No wonder the Robins Floatex Shakeout saves you time, money and headaches! Then, too, they are versatile enough to do both flask shakeout and core knockout *wherever* the work may be. In short, they save you the entire cost of an additional machine.

Floatex Shakeouts are mechanically versatile, too. Your own workmen can change the stroke as required. Thus, a Floatex which has been handling light-walled castings, for example, will handle much heavier ones just as effectively.

You can get Floatex Shakeouts in sizes to meet your particular needs —for 100-pound castings to flasks weighing 100 tons or more. Every size is genuinely full-floating. It shakes the flask, not the building.

Whether you want to do shakeout and knockout as consecutive operations, or shakeout at night and knockout during the day (when the machine would otherwise be idle) write to Robins.

Learn how both jobs can be done with *one* machine . . . by making only *one* single investment. Address Robins Conveyors Division, 270 Passaic Avenue, Passaic, N. J.

ROBINS

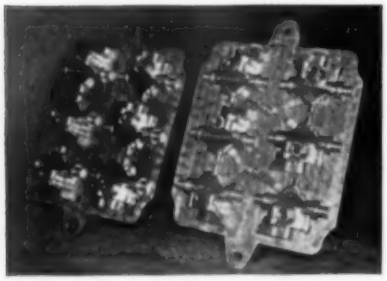
FLOATEX SHAKEOUT ®

ROBINS CONVEYORS DIVISION **HEWITT-ROBINS INCORPORATED**

HEWITT-ROBINS INCORPORATED HR

Part of our Milling Machine Section where numerous units of equipment and skilled workmen handle a wide range of work.

A view of our Duplicating Equipment used in the production of high precision patterns.



Typical all-machined pattern. This one consists of six brass patterns mounted on cope and drag steel plates.

Here is Where You Start to Save $ $ on Patterns

Right here in our Chicago plant where we are completely-equipped for the fast production of *all-machined patterns* . . . . patterns which cost far less for maintenance, patterns which speed up mold production (as cores drop into place "right"), patterns which produce castings that "fit the jig" (in the machine shop) with unerring accuracy. We say—*the patternshop is the foundry's "toolroom."* Here is where you start to make money! We invite your inquiry.

New BULLETIN on Core Blowing

We invite you to send for a copy of our new 8-page BULLETIN F

"CORE BOX DESIGNING AND RIGGING FOR CORE BLOWING"

Harry J. Jacobson and Ed. W. Swiess.

INDUSTRIAL PATTERN WORKS

PATTERNS FOR PRODUCTION—PATTERN ENGINEERING SERVICE

2600 BELMONT AVE., PHONE: IRVing—0413 CHICAGO 18, ILL.

(*Continued from page* 160)
training will be discussed.

Such items as alternate speakers, report on May annual meeting and entertainment night, picnic arrangements and other matters came up for discussion.

Next event of the chapter will be the annual picnic, to be held Saturday, Aug. 21, at Barnesdale near Waterdown, Ont. Golfers will tee off at Dundas Golf Course by 10 a.m.— *Alvin E. Bock, Standard Castings & Mfg. Co.*

Cincinnati

APPROXIMATELY 75 members and guests of Cincinnati District Chapter of the AFS met May 10 at the Engineering Society Headquarters, Cincinnati, to hear H. F. Dunn, district sales manager, Portsmouth Division, Harbison-Walker Refractories Co., speak on refractories.

Mr. Dunn traced the development of the refractory industry from the

H. F. DUNN

early method of hand ramming the brick to the present method of a combination of extrusion and pressing for all standard sizes of brick. He showed slides depicting the development of the kilns from the old style which resembled a beehive to the modern continuous type.

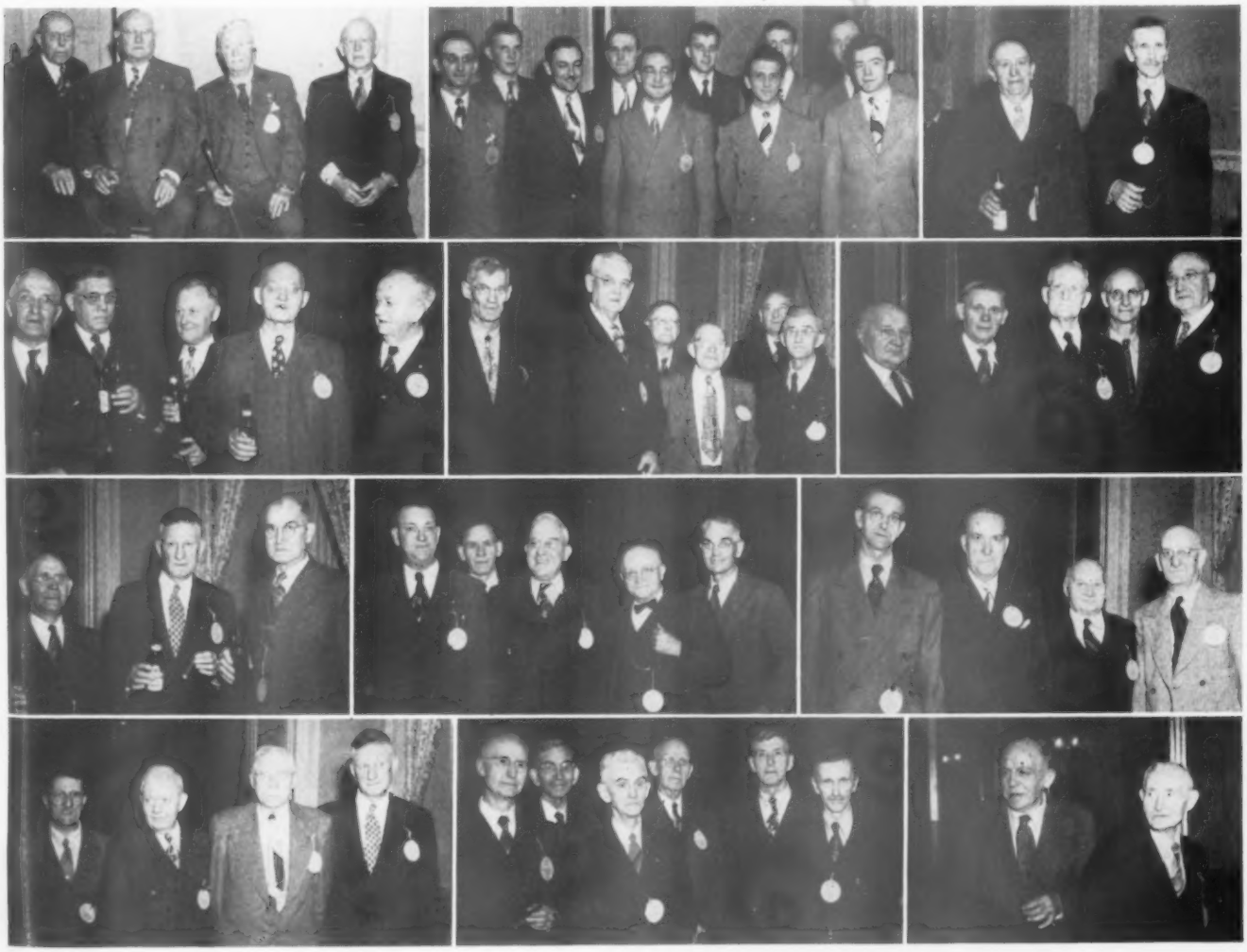
He presented a graph which showed the effect of varying the two main ingredients, silica and alumina. The graph showed that the refractoriness of a fire brick decreases as the alumina content increases until the eutectic is reached (94.5 per cent silica and 4.5 per cent alumina) after which the refractoriness of the fire brick increases. — *C. H. Fredricks, Cincinnati Milling Machine Co.*

Central New York

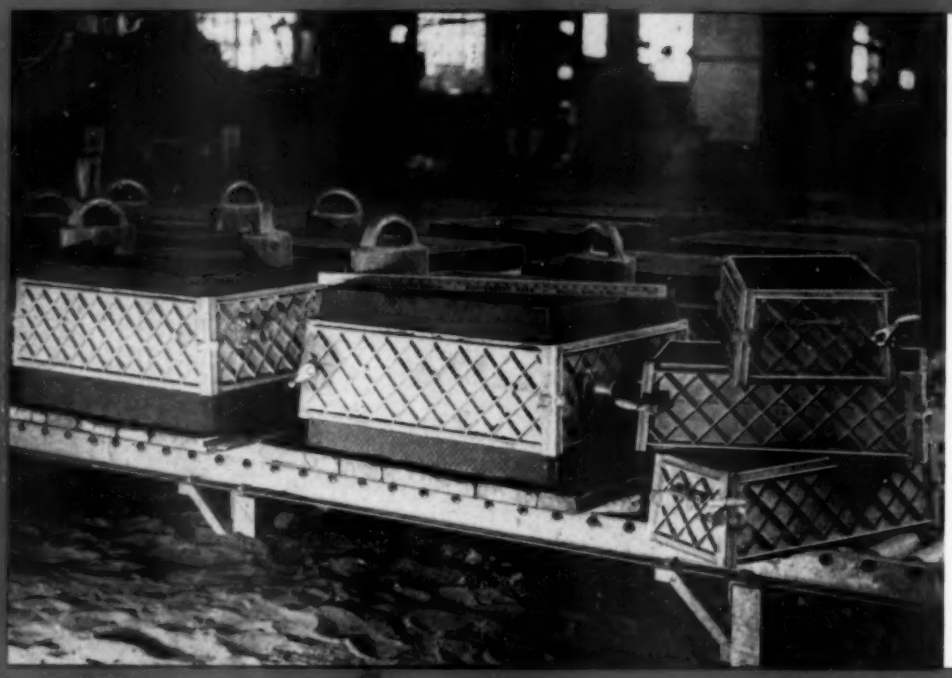
CENTRAL New York Chapter of the AFS held its annual outing and business meeting at Montour Falls, N. Y., June 16, where approximately 90 members and friends were guests of Shepard-Niles Crane & Hoist Co.

Officers elected for the coming

(*Concluded on page* 166)



WISCONSIN Chapter of the AFS honored old timers and apprentices at the chapter's annual dinner May 14 at Hotel Schroeder, Milwaukee. A group of apprentices is pictured above with some of the 103 old timers who attended the dinner. Photos by John Bing, A. P. Green Fire Brick Co.



Hines

Made In

CAST IRON OR ALUMINUM

Fully Protected by Patents and Patents Pending

Put to the TEST . . . . .a

THE HINES

3431 WEST 140th ST.

Jackets

A few typical applications of Hines Jackets are illustrated here. Machined to a smooth, flat surface inside, they fit the mold so closely that the use of weights is held to a minimum and in some cases eliminated. Available in either "slip" or "Pop-Off" styles.

...and Proved the BEST

FLASK CO.

CLEVELAND 11, OHIO

(*Concluded from page* 163)

year are: C. M. Fletcher, Fairbanks Co., Binghamton, N. Y., chairman; J. F. Livingston, Crouse-Hinds Co., Syracuse, N. Y., vice chairman; D. Dudgeon, Utica Radiator Corp., Utica, N. Y., secretary, and William Dunn, Oberdorfer Foundries Inc., Syracuse, treasurer.

Directors with terms expiring in 1951 are: R. A. Minnear, Ingersoll-Rand Co., Painted Post, N. Y.; R. C. S. Potter, Chemung Foundry Corp., Elmira, N. Y., and J. Gibson, Sweets Foundry, Binghamton.

Also appointed for the 1948-49 season were Prof. P. E. Kyle, Cornell University, Ithaca, N. Y., chairman of the educational program; William A. Mader, Oberdorfer Foundries Inc., chairman, nonferrous group, and John A. Feola, Crouse-Hinds Co., publicity chairman.

After the business meeting the members were conducted through the plant of the Shepard-Niles company where the various manufacturing and assembling operations used in the production of cranes and hoists were observed. At the buffet dinner during the evening, Sydney Buckley, company president, and S. G. H. Turner, chairman of the board, gave short talks.—*John A. Feola, Crouse-Hinds Co.*

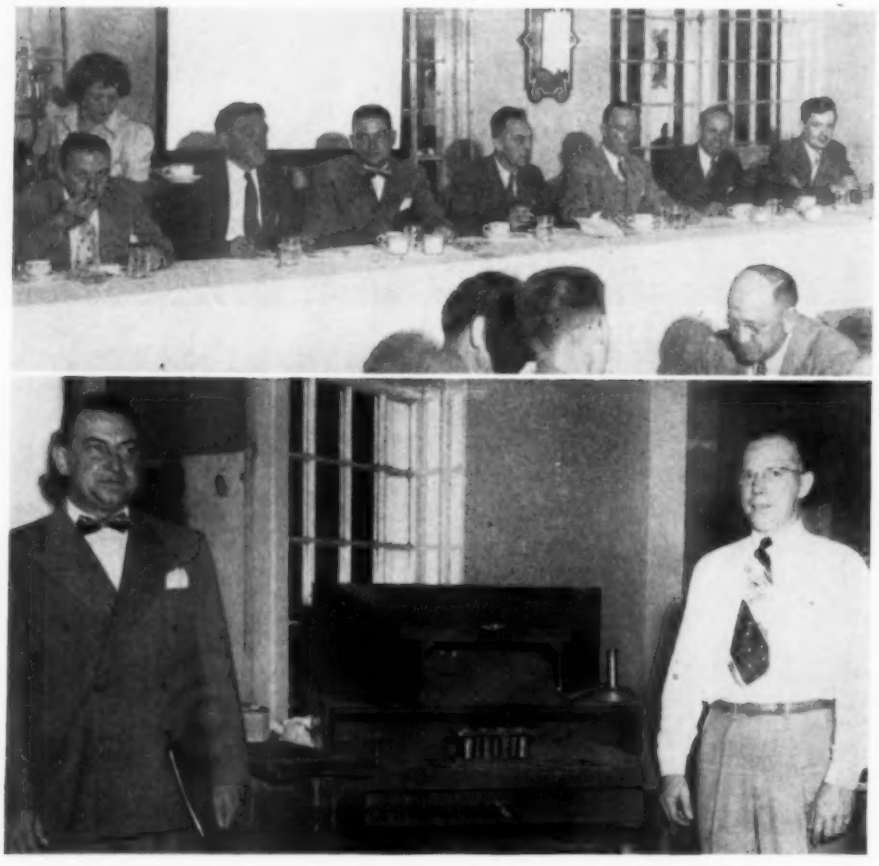
Chesapeake

CHESAPEAKE Chapter of the AFS held its last meeting of the season May 28. at the Engineers Club, Baltimore. A full program included three talks and election of officers. Blake M. Loring, Naval Research Laboratory, was elected chairman for 1948-49, and J. B. Mentzer, Wood-Embly Brass Co., Waynesboro, Pa., was chosen vice chairman. Others elected were C. A. Roebeck, secretary-treasurer; William H. Baer, technical secretary, and William H. Holtz and L. H. Denton, directors.

The coffee talk was on the interesting subject of Chinese customs, given by Maj. You Chang Tsau of the Chinese Air Force. A brief but forceful message was delivered by Douglas C. Williams, Ohio State University, on the importance of having top executives interview college graduates and offer a training program if they intend to attract good young men to the foundry industry.

Principal speaker of the evening, Clyde A. Sanders, American Colloid Co., Chicago, then took over with an informative talk on sand grain distribution. Mr. Sanders illustrated his remarks with a series of test tubes containing the sand retained on each sieve when analyzed. The speaker showed the grain distribution of a number of sands in commercial use and described their foundry properties. A lengthy discussion period followed the talk.

The Norfolk Naval Shipyard will play host to the Chesapeake Chapter in September.—*Jack H. Schaum, National Bureau of Standards.*



CENTRAL OHIO Chapter of the AFS met at Columbus, O., May 24, for the final meeting of the season. Shown above at the speakers' table are, left to right: Tom Payne; W. T. Bland, Commercial Steel Casting Co., Marion, O.; S. W. Healy, Central Foundry Division, General Motors Corp.; Ray Frank, Bonney-Floyd Co., Columbus, retiring chapter chairman; S. D. Martin, Central Foundry Division, General Motors Corp.; Fred Fuller, National Engineering Co., new chairman, and Dan Krause, Gray Iron Research Institute, Columbus. In the lower photo are Messrs. Healy and Martin (left to right) who demonstrated the application of motion study to foundry operations. Photos by W. H. White, Jackson Iron & Steel Co.

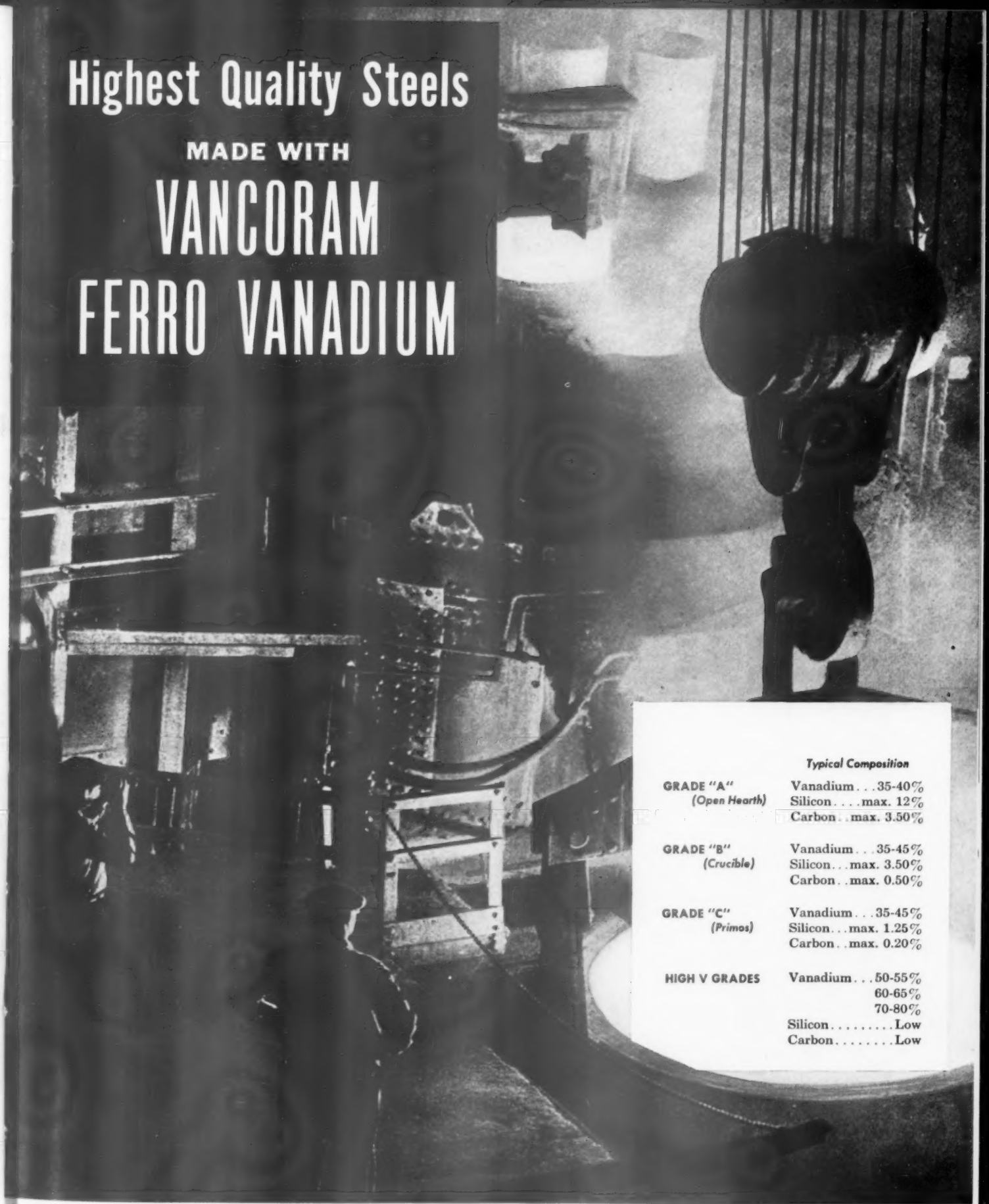
WHAT IS STRENGTH?

(*Continued from page* 101)

severly notched than many parts being made today. The notch is a sharp V notch inducing no more stress concentration than the sharp V notch at the base of threads and in the same order of magnitude as the stress concentration imposed by sharp corners, keyways and splines. In fact, the most important single step in increasing the service strength of the majority of parts being used today is not in increasing the tensile, impact or fatigue strength of the metal, but in eliminating sharp reentrant angles, sharp corners in keyways and in splines, deep sharp tool marks and last but not least, cracks.

One of the most important metallurgical advances during the war was the discovery that a smoothly finished part with no sharp corners is not necessarily the most fatigue-resistant part. Shot peening to impose compressive stresses in the surface of the part has resulted in spectacular increase in fatigue strength and service life of many parts. The foundry industry has been shot blasting many of its castings for years to clean them. Perhaps the rough cast, shot-blasted surfaces some designers are worried about, actually increase the fatigue strength of the part. If these cast, shot-blasted surfaces are resistant to fatigue, it would be a feather in the cap of castings. However, we do not know.

(*Continued on page* 168)


Highest Quality Steels
MADE WITH
VANCORAM
FERRO VANADIUM
Typical Composition
GRADE "A" (Open Hearth)
Vanadium . . . 35-40%
Silicon . . . . max. 12%
Carbon . . max. 3.50%
GRADE "B" (Crucible)
Vanadium . . . 35-45%
Silicon . . . max. 3.50%
Carbon . . max. 0.50%
GRADE "C" (Primos)
Vanadium . . . 35-45%
Silicon . . . max. 1.25%
Carbon . . max. 0.20%
HIGH V GRADES
Vanadium . . . 50-55%
60-65%
70-80%
Silicon . . . . . Low
Carbon . . . . . Low

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VANCORAM

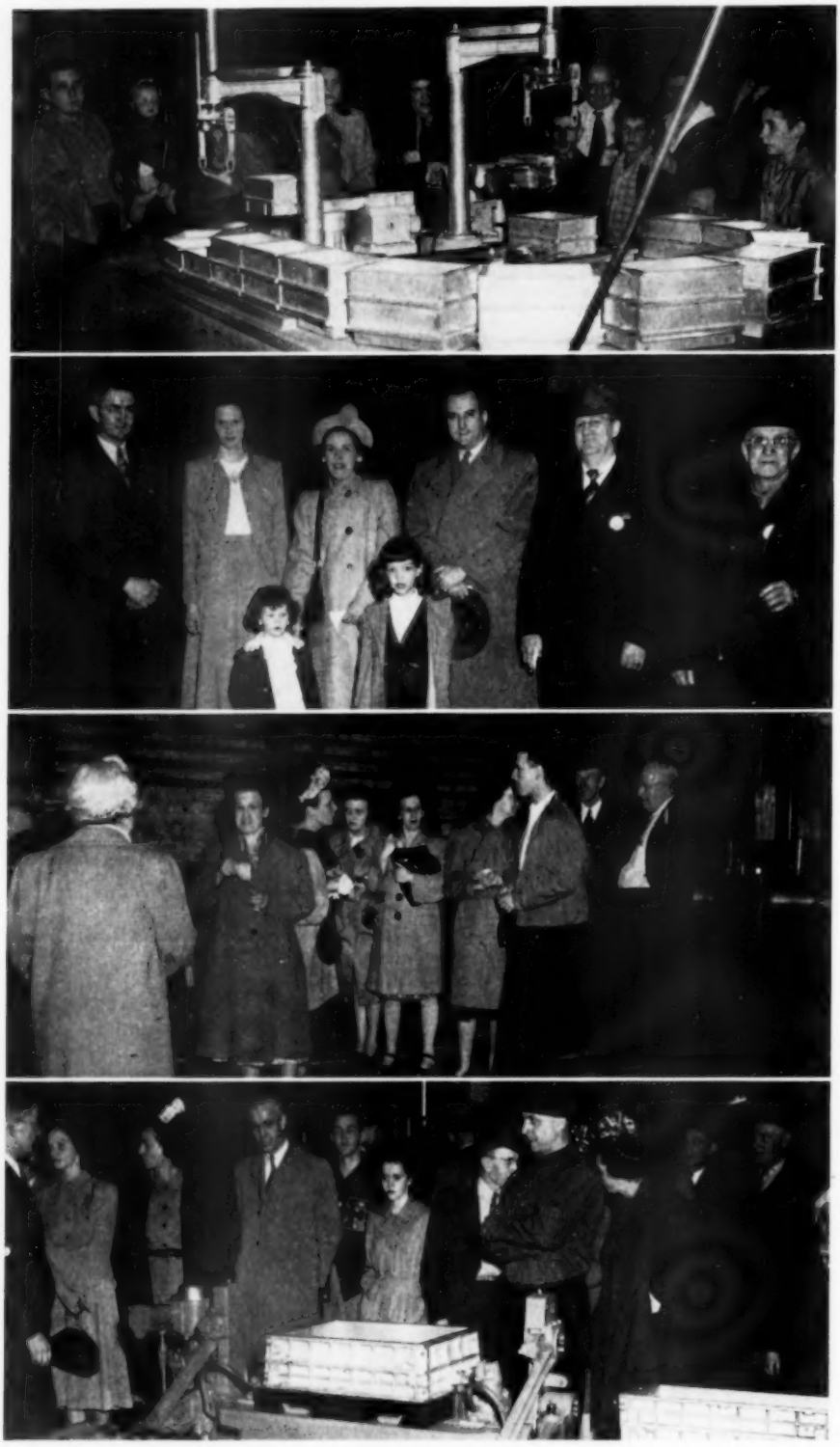
CHEMICALS AND METALS

(*Continued from page* 166)

and will not know until the foundry industry is willing to spend time and money on fatigue testing.

The lower curve in Fig. 3 should be of much interest to the nonferrous foundryman. This curve illustrates the fatigue strength of corroding wrought steel specimens. The corroding medium does not have to be a strong acid; tap water or moist air is sufficient, as is any medium that will rust the metal. If the metal is corroding, its tensile strength makes little difference, but resistance to corrosion is all-important. The nonferrous foundryman gets gray hair casting manganese and aluminum bronze and is at competitive disadvantage because of their cost. How many times are these alloys specified simply because the handbooks give them physical properties in tension comparable to steel. If the service is one involving corrosion fatigue, tensile strength means nothing and a cheaper, corrosion-resistant, more castable alloy will do the job better simply because it is cheaper.

Again, there is no information at all as to the corroding fatigue strength of cast metals, or, what may be even more important, the corroding fatigue strength of cast surfaces. There are many vague references in the literature refering to the superior corrosion resistance of cast surfaces. Where there is smoke, sometimes there is fire. Vague references cannot be incorporated into design; factual information is necessary. However, the possibilities should make a gamble of some time and money on fatigue testing of cast surfaces by the foundry industry attractive.



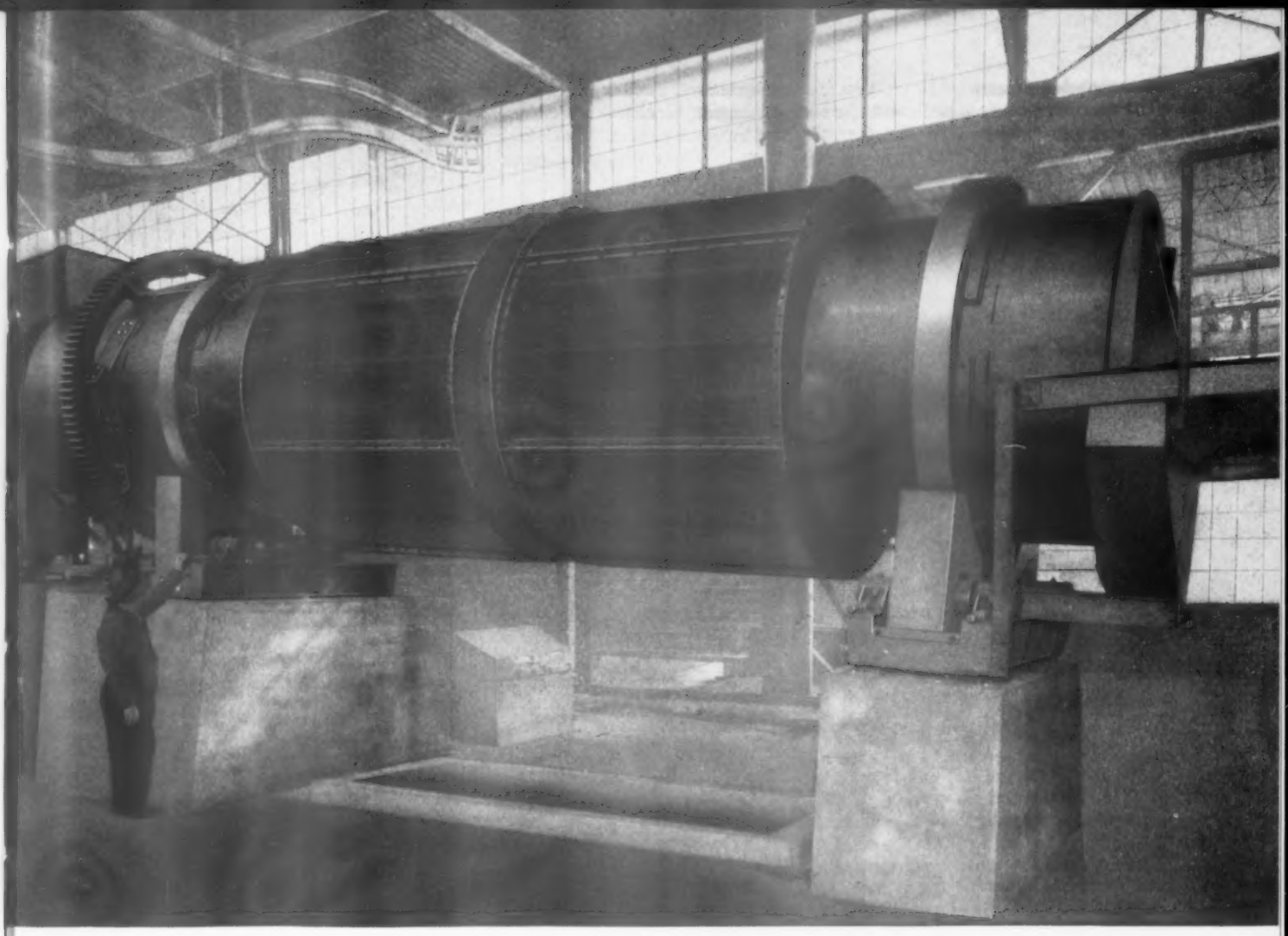
OPEN HOUSE: More than 500 people, a large percentage of them women, were guests of the Herman Pneumatic Machine Co. when the company held its first open house at its Zelienople, Pa., plant the evenings of April 15 and 16. Officials and department heads served as guides, explaining the various plant operations and uses of the manufactured products. A featured display was a complete model molding unit (top panel) which duplicates in miniature an actual installation

Compete on Equal Basis

To summarize, the long accepted tension test yields only two properties that have any meaning in design—yield strength and modulus of elasticity. Castings and cast metals can compete on an equal basis with metals formed by any other method using these two properties. The so-called ductility components of the tension test—elongation and reduction of area—are meaningless in design. Service ductility, if required, must be measured under conditions of stress concentration and dynamic shock loading, as in the notched impact test. Fatigue strength, the property that is most important in design—the ability to withstand many millions of load applications—for all practical purposes has no relation to tensile properties and is a property with no ductility component.

If it is accepted that these four properties should be used to evaluate metals and have been evaluated, there is still the question of control. All four tests are objectionable from the control standpoint, for they are destructive. The same objection applies to the standard tension test. No control test can ever be satisfactory if it does not test the part to

(*Concluded on page* 170)



It cools and screens hot shakeout sand

THE Bartlett-Snow Rotary Sand Cooling Screen pictured above (with dust hood and collecting hopper removed) handles about 135 tons per hour of hot shakeout and returned spill sand, in a large grey iron production foundry, reducing sand temperatures 25° to 50°F. preliminary to storing and mulling. The shell is 72″ in dia. by 28′ long, trunnion mounted, double jacketed and girt gear driven.

Incoming sand passing into the 10 foot breaker section is raised and dropped by lifting flights, breaking up the core lumps so effectively that little waste sand passes through to the tote box.

The fines pass through two double jacketed screening sections, each 6′ long, and discharge into a collecting hopper feeding to a belt conveyor. The dust hood is so mounted over the screen that air can be drawn in from the sides as well as through the ends of the screen, assuring dust-free operation and efficient cooling.

This screen is only one unit in a complex foundry completely engineered and installed by Bartlett-Snow . . . with molding, pouring, shakeout and cleaning operations synchronized so accurately that metal from the cupola is loaded into freight cars as inspected casting 1¼ hours after pouring.

Let the Bartlett-Snow foundry experts with their intimate familiarity with the needs of practical day after day foundry operation,—work with you on your next sand, mold, or castings handling problem. The C. O. Bartlett & Snow Company, 6200 Harvard Avenue, Cleveland 5, Ohio. Engineering representatives in New York, Baltimore, Detroit and Chicago.

BARTLETT-SNOW
CLEVELAND 5, OHIO

DESIGNING AND CONTRACTING ENGINEERS

For the Foundry Industry

SAND, MOLD AND CASTINGS HANDLING EQUIPMENT

(*Concluded from page* 168)

be used. The control of one of the four properties, modulus of elasticity, is simplicity in itself, for this property is inherent and invariable for any given metal. It does not change and cannot be changed. Therefore no control is necessary.

A nondestructive control for tensile yield strength is possible by means of the brinell hardness test. It is generally accepted that there is a good correlation between brinell hardness and tensile strength. It is not generally known that an equally good correlation exists, at least for cast steel, between brinell hardness and yield strength. Straight line relationships exist between the three properties, as illustrated in Fig. 4. The range of scatter of the individual points due to all variations in the tests and material is plus or minus 20 points brinell. It is reasonable to presume that similar relationships hold for other metals.

Design and Finish Important

The control of fatigue strength is mostly out of the hands of the metal producer, except his responsibility for furnishing material free from flaws. Of equal importance is the design and finish of the part, the responsibility of the inspector of the finished part to be sure that no sharp corners and tool marks are present. Changes in physical properties of the metal itself are of only minor importance.

No proven nondestructive control procedure is known at present for the last property, notched impact strength. Some type of fracture is necessary to check this property. However, there is a possibility that a separate specimen is not necessary. There is a distinctive difference in the appearance of the fracture of a notched brittle steel when compared with a notched tough steel. As this property is required only in service with severe shock loading, it is usually important only in steel construction. A brittle fracture of steel is coarsely crystalline in comparison with a fine-grained fibrous fracture of a nonbrittle fracture. This difference is independent of the grain size of the steel. Perhaps small lugs can be cast on the castings, notched with a chisel or saw and broken off, the appearance of the fracture being used as a control of this property. Similar procedures have been used and are being used for wrought steel for critical applications. The only major inconvenience of this control test is the necessity of refrigerating the casting and test lug before fracture if the part is to be used at low temperatures.

It should be emphasized that this last property, notched impact strength, is not of prime importance in many applications and for many metals. The first two properties, yield strength and modulus of elasticity, are important in any design. The third, fatigue strength, is important only for structures containing moving parts, or subject to vibration. The fourth, notched impact strength, is necessary only if the part must withstand severe shock loading under conditions of stress concentration, and even then, many times, only if the part is to be used at temperatures below freezing.

There is another important control test that must be made by the foundryman if we are to give our attention to serviceability tests made on the part to be used, instead of routine tension tests on a part to be thrown away. This is a test for soundness. All evaluation is based on sound metal and is meaningless unless the part to be used is sound. Radiography, a nondestructive test to insure the part to be used is sound, will enable the foundryman to sell his castings on a sound basis; this means to sell his castings as parts that will compete on at least an equal footing with any part, formed by any method and one that answers the basic definition of quality—the cheapest part that will perform satisfactorily.

ASTM HOLDS 51st ANNUAL MEETING

(*Continued from page* 104)

field of research, was presented to N. L. Mochel, manager, metallurgical department, Westinghouse Electric Corp., and P. R. Toolin, research engineer, mechanics department, Westinghouse Research Laboratories, for their paper presented in 1947 on "The High - Temperature Fatigue Strength of Several Gas Turbine Alloys." The Richard L. Templin award, provided to stimulate the development of test methods and apparatus, was given to G. S. Burr, W. J. Gailus, J. O. Silvey, S. Yurenka and A. G. H. Dietz, Massachusetts Institute of Technology, for their 1947 paper on "Universal Plastics Testing Machine."

The annual Marburg Lecture, which commemorates the name of the society's first secretary, was delivered by Dr. P. C. Aebersold, Atomic Energy Commission. Discussing "Isotopes and Their Application in the Field of Industrial Materials," he stressed the tremendous possibilities of these new materials which now are available for use in a wide variety of applications.

In his presidential address T. A. Boyd, retiring president, reviewed the period from 1918 through 1948, indicating the tremendous increase in research activities and emphasizing the fact that probably no other small group of men has influenced our economy as much as research workers. He stressed the need for not only competent research facilities but also competent personnel.

Tentative Method Continued

Report of Committee A-1 on Steel, submitted by N. L. Mochel, Westinghouse Electric Corp., Philadelphia, stated that Tentative Methods A 272 for magnetic particle testing and inspection of steel castings would be continued as tentative. Certain editorial changes and higher silicon limits are under consideration for Tentative Specifications for Mild to Medium Strength Carbon Steel Castings (A 27). Committee A-9 on Ferroalloys is being reactivated following inactivity during the war, it was indicated in the report presented by W. C. Bowden Jr., Ledoux & Co., New York. Preparation of a manual on fatigue properties comprised the principal work last year of Committee E-9 on Fatigue, according to the report presented by R. E. Peterson, Westinghouse Electric Corp., East Pittsburgh, Pa.

Report of Committee A-3 on Cast Iron, given by Dr. J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, recommended publication of Tentative Specifications for Gray Iron Castings for Non-Pressure Containing Parts at Elevated Temperatures. It also recommended revisions in Standard Specifications for Gray Iron Castings (A 48-46), and continuation as tentative of Tentative Specifications for Foundry Pig Iron (A 43-45T) for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 F (A 278-44T). In the case of the latter, additional information on creep strength of various cast irons is considered desirable to facilitate its wider adoption. E. R. Young, Climax Molybdenum Co., Chicago, recently vice chairman, is succeeding Dr. MacKenzie as chairman of Committee A-3.

Reporting for Committe A-7 on Malleable Iron Castings, W. A. Kennedy, Grinnell Co., Providence, R. I., recommended revisions relating principally to test specimens in Tentative Specifications for Pearlitic Malleable Iron Castings (A 220-47T).

(*Continued on page* 172)

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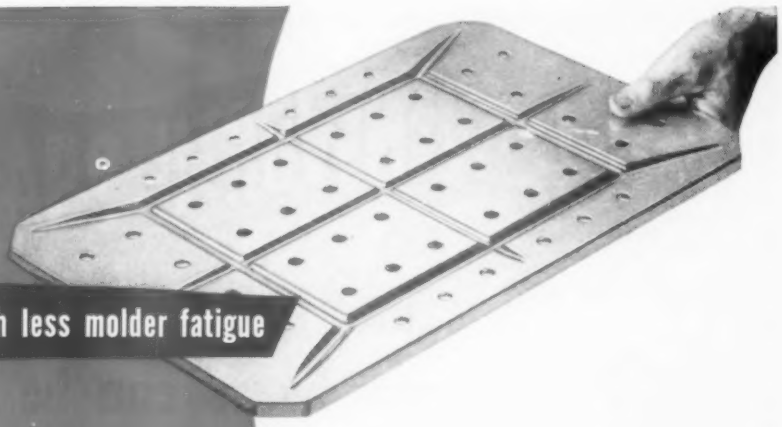

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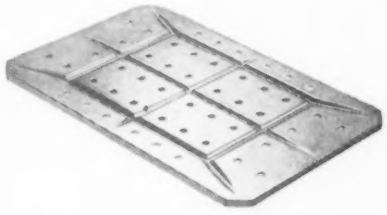

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(*Continued from page* 170)

The committee also recommended various revisions in the Standard Specifications for Malleable Iron Castings (A 47-47).

Committee B-5 on Copper and Copper Alloys, Cast and Wrought, under chairmanship of G. H. Harnden, General Electric Co., Schenectady, N. Y., submitted some 34 recommended changes. These included adoption as standard without revision the following: Leaded High-Strength Yellow Brass (Manganese Bronze) Sand Castings (B 132-46T), Leaded Red Brass and Leaded Semi-Red Brass Sand Castings (B 145-46T), Leaded Yellow Brass Sand Castings for General Purposes (B 146-46T), Aluminum Bronze Sand Castings (B 148-46T), Leaded Nickel-Brass (Leaded Nickel-Silver) and Leaded Nickel-Bronze (Leaded Nickel-Silver) Sand Castings (B 149-46T), and Silicon-Bronze and Silicon-Brass Sand Castings (B 198-46T).

Adopt as Standard

With minor revisions the following also were recommended for adoption as standard: Copper-Ease Alloys in Ingot Form for Sand Castings (B 30-45T), Tin-Bronze and Leaded Tin-Bronze Sand Castings (B 143-46T), High-Leaded Tin-Bronze Sand Castings (B 144-46T), and High-Strength Yellow Brass (Manganese Bronze) and Leaded High Strength Yellow Brass (Leaded Manganese Bronze) Sand Castings (B 147-46T).

Committee B-5 recommended that Recommended Practice B 208 for preparing tension test specimens for copper-base alloy castings be continued as tentative pending revisions being formulated by the test bar task group. Subcommittee F-1 on Castings, and Ingots for Remelting has under way the revision of sampling requirements in Specifications B 30 and the preparation of appendices for Specifications B 147 and B 198 (Silicon-Bronze and Silicon-Brass Sand Castings.).

Report of Committee B-6 on Die-Cast Metals and Alloys, submitted by J. R. Townsend, Bell Telephone Laboratories, Murray Hill, N. J. recommended revisions in three tentative specifications: B 85, B 94 and B 176 covering aluminum-base, magnesium-base and copper-base alloy die castings, respectively. It also recommended revisions in the standard specifications for zinc-base alloy (B 86) and lead and tin-base alloy (B 102) die castings.

Committee B-7 on Light Metals and Alloys, Cast and Wrought.

(*Concluded on page* 174)

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(*Concluded from page* 172)

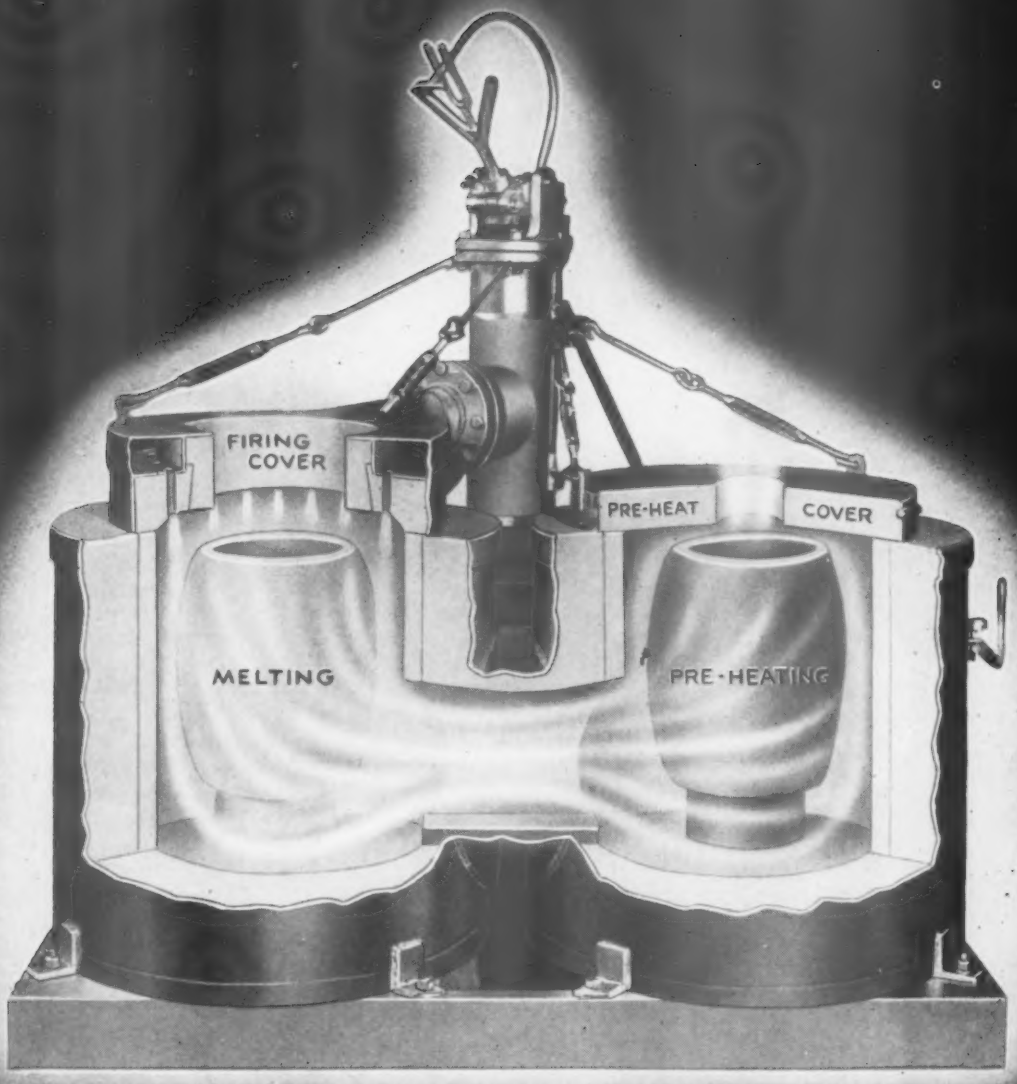
through its chairman, I. V. Williams, Bell Telephone Laboratories, New York, reported that its Subcommittee II on Aluminum-Alloy Castings has had two task groups working on proposed revisions of Specifications B 26 and B 108 which were expected to be submitted shortly to the Committee on Standards.

Considerable interest in ultra-sonic testing was evidenced by the large attendance at a round-table discussion of this subject Monday afternoon. Application of this method, which makes use of sound waves at a frequency beyond the audible range, has been rather limited in the foundry industry. Wrought metals offer a better medium for sound wave penetration than does a cast structure. However, one steel foundry reported use of an ultra-sonic unit in testing mill rolls for internal defects. In addition to its use for testing purposes experiments have been reported in adapting ultra-sonic waves to the degassing and grain size refinement of nonferrous metal alloys. So far such work has not progressed beyond the laboratory stage. The session on ultra-sonic testing was sponsored by Committee E-7 on Radiographic Testing, which is expanding its activities to include nondestructive testing in general.

Film Used in Training Program

An interesting movie on "Modern Quality Control" was presented at a Tuesday afternoon session by Simon Collier, Johns-Manville Corp., New York. This film is employed in a training program instituted by the company to teach modern techniques of quality control to its production and inspection personnel. The program is an answer to the more critical demands of customers for quality products following a lowering in quality standards during the war years when many substitute materials were employed.

A wide variety of testing and research apparatus and laboratory equipment was displayed by some forty suppliers in the Book-Cadillac Hotel during the week. In addition to these exhibits several ASTM committees sponsored displays relating to their work. Another feature was the Sixth Photographic Exhibit, which depicted the general theme "Materials, Testing and Research." This included, in addition to photographs, a number of photomicrographs sponsored by Committee E-4 on Metallography and a similar section on radiography under Committee E-7 on Radiographic Testing.



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CASTING STEEL CENTRIFUGALLY

(*Continued from page 77*)

on either a vertical or a horizontal axis, while long ones are almost always poured in a horizontal position. However, they are made, the wall thickness of the castings varies directly with the amount of metal poured into the molds. In some cases the latter are entirely of metal, in others a sand lining is used.

Except when heavy-walled castings are made in sand-lined molds, the steel solidifies progressively from the outer surface toward the inside, so that the contraction of each layer as it freezes is automatically compensated by the still unfrozen inner layers. The "centerline shrinkage" so prevalent in thin sections of steel cast statically is therefore, usually absent in castings made by the true centrifugal method, and extra metal need not be provided to produce a solid casting. Consequently, much thinner tubes can be made centrifugally than by the older practice, and in addition, the yield of castings per unit of steel in the ladle is far higher in true centrifugal than in static pouring.

Collect Near Inner Walls

At the same time, the pressure produced by the high spinning rates used in the process tends to drive the heavier materials to the outside of the molds, and lighter particles toward the center, as cream and milk are parted from each other in a separator. Thus, any entrained slag and other nonmetallic materials in the steel tend to migrate toward the last-freezing inner layers of the casting. The outside, solidifying first, therefore contains less nonmetallic material than is present in statically-poured pieces, and most of the inclusions will be concentrated near the inner walls.

When comparatively thin cylinders are made in metal molds, however, solidification is so rapid that the elimination of non-metallics in this manner does not proceed very far. Blow-holes produced by the liberation of dissolved gas as the steel freezes also tend to be eliminated by the rejection of the gas toward the inside of the piece, and centrifugally cast tubes are therefore usually quite free from these defects. The steel used in the process, however, must be carefully made, since the pressure set up in the molds is not high enough to produce perfectly sound castings from really "gassy"

(*Continued on page 178*)

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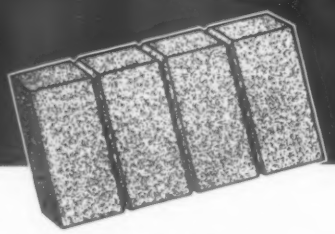

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(*Continued from page* 176)

steel.

These advantages of true centrifugal pouring have been amply proved by experience, and are not open to question. However, attempts have been made to show that the method improves the steel in many other ways, so that centrifugally poured castings have finer grain structure, better mechanical properties, improved resistance to wear, and in general far better all-around excellence than well-made castings poured in stationary molds. It is sometimes even asserted that centrifugally poured steel is somehow "worked" by the pressure set up in the process, so that it resembles forged, rather than cast, steel.

It can be stated without the slightest hesitation that there is no basis in fact for these claims, and that the properties of steel poured by the true centrifugal method are indistinguishable from those of well made castings poured in stationary molds. As will be shown in detail further on, this is true to an even greater extent of castings made by the semi-centrifugal and centrifuging methods.

Develop Center Line Shrinkage

When sand-lined molds are used, progressive freezing from outside to center will not occur if the thickness of the wall of the casting exceeds a certain figure. This critical dimension will vary with the thickness, and therefore, the heat-radiating capacity of the sand of the mold wall, and with the diameter of the casting. For a given wall thickness, the size of the central opening in a casting of large diameter is so much greater than in one of small diameter, that much more heat will be carried away by the air inside the larger mold. In a casting of large diameter, therefore, the inner surface will start to freeze when the wall thickness is less than it would be in the case of a smaller piece. When solidification proceeds from both the outer and the inner surfaces, there necessarily will be a certain amount of "center-line shrinkage" in the casting, set up when the last of the steel freezes. In sand-lined molds, then, there is a definite limit to the wall thickness of castings that can be made perfectly solid throughout.

To limit as far as possible the loss of heat from the inside surfaces of heavy-walled tubes cast in sand lined molds, some makers[1] resort to the use of exothermic heat insulating powder, which is fed into the mold as soon as all the steel has been poured.

(*Continued on page* 180)

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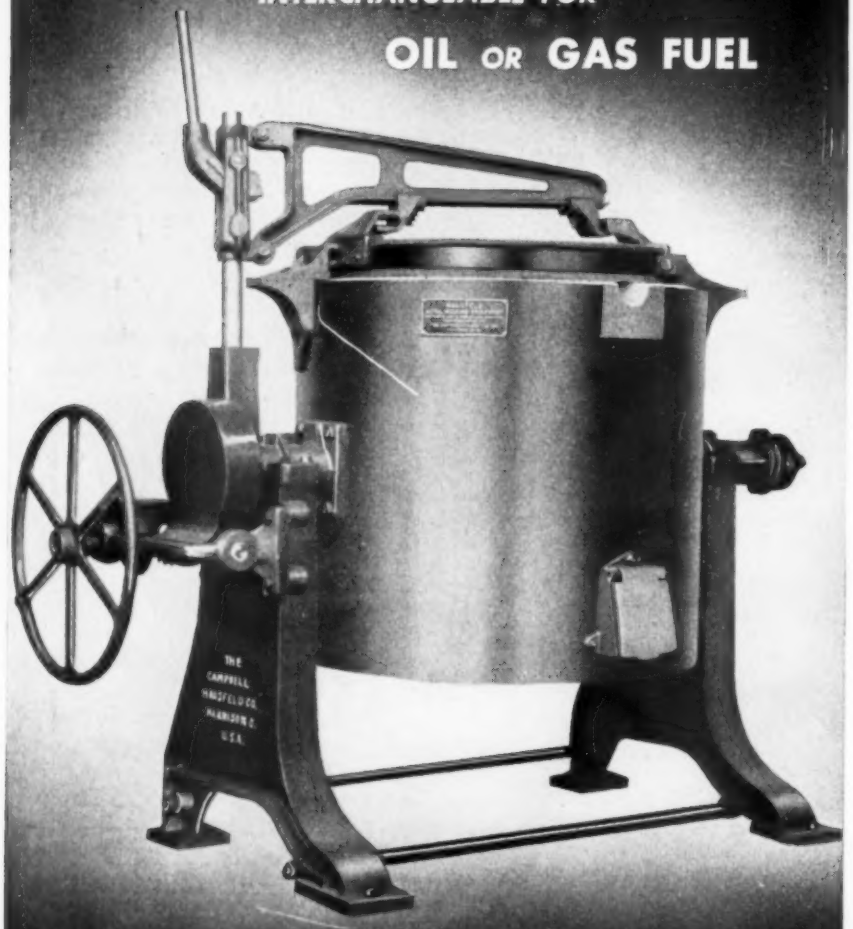

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(*Continued from page* 178)

By postponing the time when the steel begins to solidify at both the inner and the outer surfaces, this practice is said to greatly increase the wall thickness of tubes that can be cast solid in sand molds, for any given diameter.

In all-metal molds the same condition exists, but the walls of the casting will be much thicker before solidification from the inside begins than when the piece is surrounded by a layer of sand. The use of all-metal molds, therefore, enables the foundryman to make castings free from centerline shrinkage, with walls considerably heavier for a given outside diameter, than can be successfully poured in sand lined molds.

Segregation in Thick Sections

It has also been found that there is a strong tendency for segregation to occur in heavy-walled cylinders cast in sand-lined molds, which necessarily solidify very slowly. The first metal frozen contains somewhat less carbon and other metalloids than the steel poured into the mold, the excess being rejected into the still unfrozen metal, and as each layer solidifies the same process is repeated. Thus, there is a steady increase in the content of metalloids, especially carbon, manganese and sulphur, from outside to inside of the cylinder walls. The phosphorus and silicon may also be somewhat higher in the inner layers. When the inside of the tube is bored out, this segregation is largely removed, but in pieces that are machined only on the outside, or used in the rough state, it may seriously affect the usefulness of the casting.

In true centrifugal practice, so many fewer operations are required for all-metal molds than for sand-lined ones, that the former are usually preferred whenever the casting is of suitable size and shape. In general, this means that a casting to be made in a metal mold must be comparatively short, since liquid steel will not flow as far over metal as over sand. The piece to be made must also be so shaped that it can be slipped or pushed out of the mold. Were it feasible to use two-part molds, keyed or bolted together, more complicated shapes could be made in metal molds. This, however, is virtually impossible, because of the difficulty of maintaining a perfectly tight joint between the two parts of a mold that is heated up and cooled down repeatedly, and thus tends to warp out of shape. With few exceptions, therefore, metal molds are

(*Continued on page* 182)

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That's the story of Manhattan Cut-Off Wheels on this Tabor machine in the plant of the Empire Steel Castings Co. at Temple, Pa. The operator photographed above is cutting off riser and gate on a high alloy stainless steel casting for a pressure valve insert. In the foreground, you see the valve insert before the cut-off operations. 16" x ⅛" Manhattan Cut-Off Wheels give most satisfactory service, according to Empire cleaning shop foreman. "In fact they wear down so evenly we are able to use them in their reduced size for a lot of little grinding jobs around here."

Developments in both rubber and resinoid bonds have greatly increased the number of cuts per wheel, and improved the quality of cut. Manhattan Cut-Off Wheels are "pay-off" wheels. Be sure to try Manhattans in your foundry and prove them for yourself.

ABRASIVE WHEEL DEPARTMENT

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PACKINGS — POWDERED METAL PRODUCTS — ABRASIVE & DIAMOND WHEELS — BOWLING BALLS

MANHATTAN RUBBER DIVISION PASSAIC, NEW JERSEY

(*Continued from page* 180)

used only for the production of rather small cylinders or cups of simple shape, and are always made in one piece.

If the mold is revolved in a horizontal position, the casting will be practically a true cylinder. When the axis of rotation is vertical, or at an inclination to the horizontal, the inside surface will be a paraboloid of revolution, whose exact outline can be accurately calculated.[2, 3] In the case of small castings whose height is not much greater than their diameter, however, the deviation from a true cylindrical shape can be made very slight. Though a vertical mold must be spun faster than a horizontal one in order to force the metal against the face of the mold, it is so much simpler to pour into a vertical mold that a few operators prefer this method for the production of small castings. The steel can be poured, of course, directly into a vertical mold from the small ladle in which it is measured or weighed, while with a horizontal mold a pouring funnel with a horizontal delivery spout must be provided.

Pour Into Spinning Mold

In making true centrifugal castings of gray iron and of nonferrous alloys, at least part of the metal is sometimes poured into the mold before spinning is started. Steel, however, solidifies so quickly that the mold must be revolving rapidly before any metal is poured into it. This is especially true when all-metal molds are used, because the steel freezes so quickly in them that if it were poured into a stationary mold it would form a mass on one side which would throw the machine out of balance and make it vibrate badly. This will be readily understood when one considers the high spinning speeds required in the process.

The metal usually enters a revolving mold with no velocity of rotation at all, and must be brought quickly to a high enough speed so that it will revolve with the mold without "raining", in the case of horizontal pouring, or failing to fill the mold to the top, when a vertical mold is used. The contents of the mold, of course, must be made to revolve solely by the friction between the mold wall and the liquid steel, until a thin layer has solidified, and after that by the friction between the solid and the liquid layers. Once the entire contents of the mold have been brought up to speed, the rotation of the remaining liquid steel

(*Continued on page* 184)

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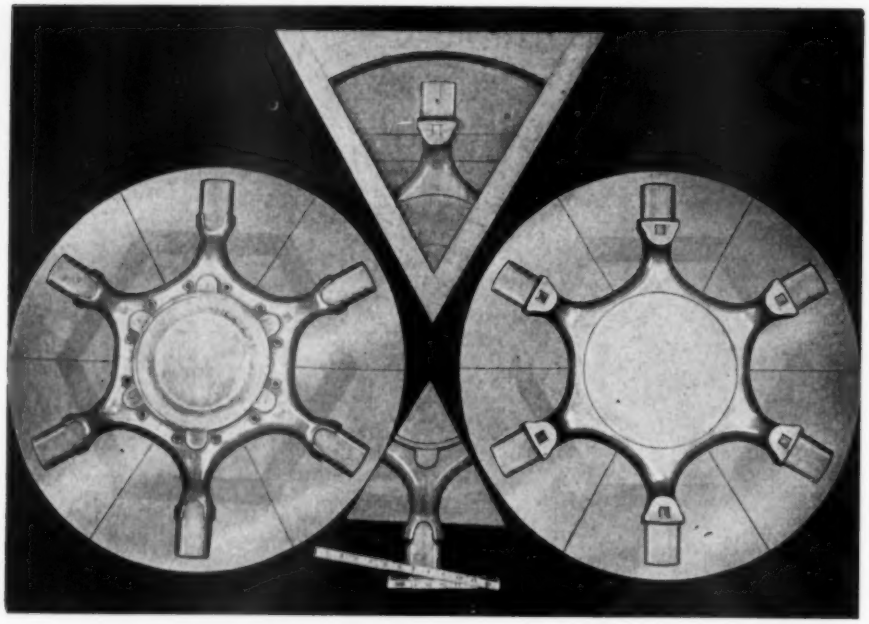

Cope and drag equipment for truck wheel, made from one spoke (1/6) of wheel.

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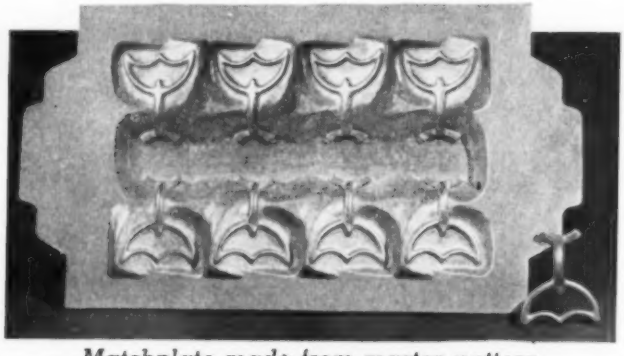

Matchplate made from master pattern

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534 State Street — Toledo 2, Ohio
Affiliate—Plaster Process Castings Company, 6922 Carnegie Ave., Cleveland 3, Ohio

Pressure-Cast MATCHPLATES
COPE and DRAG PLATES

(*Continued from page* 182)

must be maintained by the friction between it and the solidified layers.

Naturally, friction between any liquid and a solid is rather low, so that in order to bring the steel in a mold to the desired speed quickly, the latter must be revolved at a very rapid rate. Once revolving, the liquid steel in a horizontal mold will stay in place without "raining" from the top, if it spins fast enough to produce a centrifugal force equal to, or rather just exceeding, the force of gravity.

The relationship between diameter, speed of rotation and force in terms of gravity may be expressed in an equation derived from the basic formula for centrifugal force. Thus, if

M = Rotating mass
F = Centrifugal force
Q = Ratio between centrifugal force and mass
g = Acceleration of gravity = 32.17
v = Velocity in feet per second at center of gravity of rotating mass
D = Diameter in feet at center of gravity
r = Radius in feet at center of gravity = ½ D
N = Revolutions per minute

For any ratio Q between F and M, by definition,

$$(1) \quad F = QM$$

The formula for centrifugal force is

$$(2) \quad F = \frac{Mv^2}{gr}$$

Combining (1) and (2), we have,

$$(3) \quad QM = \frac{Mv^2}{gr}, \text{ or } Q = \frac{v^2}{gr}$$

At any given value of N,

$$(4) \quad v = \frac{N\,(2\pi r)}{60}$$

Therefore,

$$(5) \quad Q = \frac{\frac{N^2 4\pi^2 r^2}{3600}}{gr}$$

Simplifying the above, we have,

$$(6) \quad N = \frac{30}{\pi}\sqrt{\frac{Qg}{r}}$$

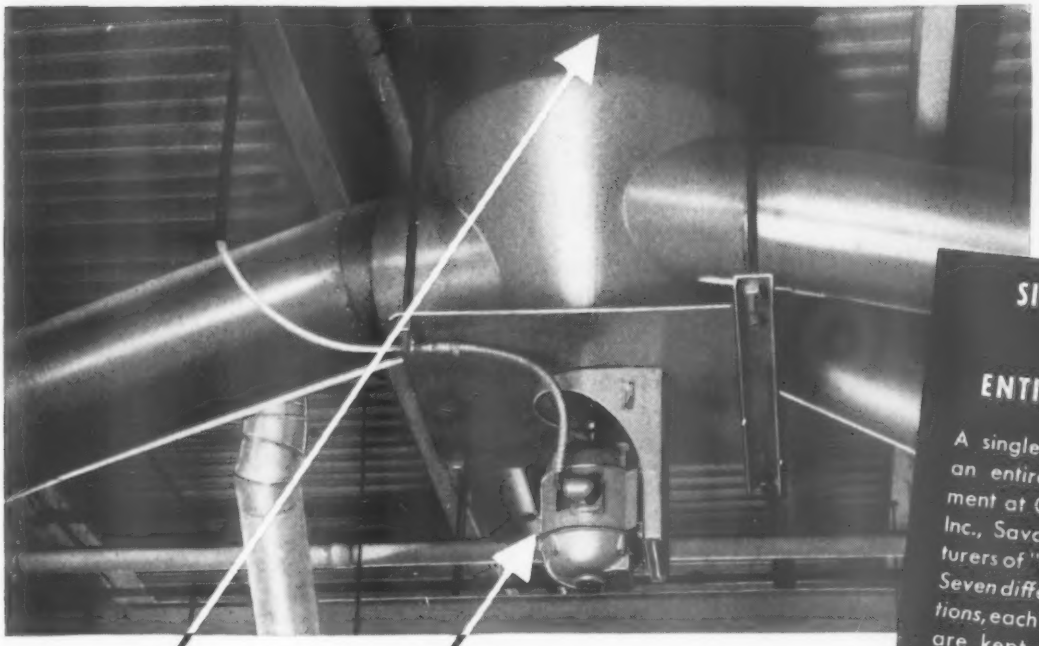
Substituting values for π and g, and 1/24 of D in in. for (r), we have,

$$(7) \quad N = 265.3\sqrt{\frac{Q}{D}}$$

For any given value of Q, the relation between N and D may be shown by means of curves, such as

(*Continued on page* 186)

Clears out dust and fumes for lower production costs



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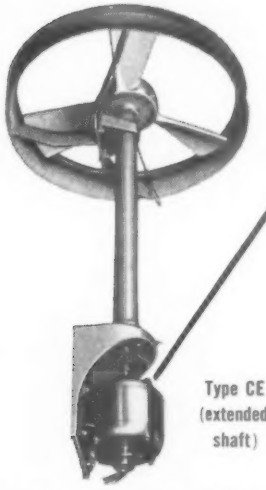

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(*Continued from page* 184)

those of Fig. 1, taken from an article by Zuehlke[4]. For ready reference, however, the nomogram given by Donoho[5], and here reproduced as Fig. 4 is handier, as it enables one to determine quickly the speed required to obtain any given value of Q, over the range of diameters commonly encountered in true centrifugal practice.

By definition, the metal will continue to revolve in a horizontal mold without "raining", when the centrifugal force is equal to, or just over the force of gravity, or when Q equals or exceeds 1. From the above equation, this will be the case when,

$$N = \frac{265.3}{\sqrt{D}}$$

Obviously, the smaller the diameter, the higher N must be, for Q to equal gravity. Therefore, as a mold of a given size fills up, the speed required to keep the successive layers of steel from "raining", steadily increases. The first steel poured into a 9-in. diameter mold, for instance, must rotate at 88.43 rpm, but after the wall thickness has increased to 2½ in., so that the inside diameter is only 4 in., a speed of 132.65 rpm is needed to prevent "raining". At a wall thickness of 4 in. the inside diameter will be 1 in., and the required rpm will be 265.3. Theoretically these rates of revolution will just maintain the liquid metal in position, once it is up to speed. In actual practice, however, such factors as friction, surface tension, inertia, etc., modify the results radically. As a result, it is known that as a spinning mold is gradually slowed down, "raining" will begin when the mold is rotating at a speed which would give Q at the inside surface of the metal a value of 3 to 4½ if there were no slippage between the mold and its contents.[1]

At exactly what rate the mold must be revolved to form a tube of any given diameter and wall thickness, is another matter. In practice, it has been found that in order to bring the steel up to speed rapidly and distribute it properly in the mold, a horizontal sand-lined mold should be spun at such a rate as to make Q at the periphery equal to 75, and a metal mold, in which a skin of solid steel is more quickly formed, fast enough to make Q at the periphery equal 60. In small metal molds revolved in a vertical position, a speed is recommended that will make Q at the periphery equal 100.

To fulfill these conditons, a tube 9 in. in diameter must be revolved at 684.4 rpm for a Q of 60, and at 765.8

(*Continued on page* 188)

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(*Continued from page* 186)

rpm if Q be 75. To maintain the same ratios of Q when the inside diameter of the tube has decreased to 4 in., the speeds must be 1036.7 for a Q of 60, and 1148.7 if Q is to be 75. The recommended speeds therefore are $\sqrt{Q}$ times as high as the theoretical minimum speeds that will prevent "raining". Were the inside diameter reduced to 1-in., for Q to be 60, N would be 2053, for a Q of 75, N would be 2297, and if Q be 100, N would be 2653. Somewhere between the speeds required to give Q at the periphery a value of 60 or 75, and the theoretical minimum for a Q of 1, will be found the ratio at which the molds can safely be spun, once their contents have been brought up to the calculated maximum speed.

In pouring tubes in a vertical mold, the theoretical minimum speed is not simply that necessary to create a centrifugal force equal to gravity, as a horizontal mold, but that required to set up a vertical force great enough to hold the metal, against gravity, to a varying height up the inside of the mold. According to Carrington[5] the theoretical minimum speeds N, for the two conditions illustrated in Fig. 2 are as follows:

$$(1) \quad N = 264.3 \frac{\sqrt{L}}{RT}$$

$$(2) \quad N = 264.3 \sqrt{\frac{L}{RT^2 - RB^2}}$$

Increases Fork Truck Usefulness

ONE foundry has gained extra use of its fork trucks through use of a specially designed truck-borne, dump-bottom, skid-hopper. The hopper permits dumping castings into bins, chutes and processing equipment such as the tumbler shown here, which are located several feet above floor level.

The hopper is a square metal skid box with the bottom hinged along one edge. Sides integral with the bottom have been bent up along the two sides of the box, and a hook welded to the back of the bin is used to hang the hopper from a notched member welded to the top of the truck mast. Hopper is dumped by hanging it from the notched member and then lowering the forks to release the hinged bottom. Chains limit the degree to which the bottom can open. This dumping arrangement permits control of the flow of material from the bottom of the box. Photo courtesy Yale & Towne Mfg. Co., Philadelphia.

When L is 8-in., RT 2-in. and RB 1.75-in., for case (1), N is 374 rpm, for case (2), N is 772 rpm.

In a horizontal mold, the theoretical minimum speed for an inside diameter of 4-in. is 133 rpm. It is evident, therefore, that to pour a cylinder 8-in. high, with an inside diameter of 4-in. at one end, and 3.5-in. at the other, the theoretical minimum speed is nearly 6 times as high as that required to pour the same cylinder, 4-in. in inside diameter throughout, on a horizontal axis.

To minimize these very high speeds, and at the same time retain some of the advantages of pouring without a horizontal funnel, the mold may be inclined at an angle with the horizontal. Under these conditions, Carrington[5] gives the following expressions for the minimum speeds for the same castings shown above, but at an angle with the horizontal, as in Fig. 3:

$$(3) \quad N = 264.3 \frac{\sqrt{L \sin A}}{RT}$$

$$(4) \quad N = 264.3 \sqrt{\frac{L \sin A}{RT^2 - RB^2}}$$

For the dimensions already given, (L = 8-in., RT = 2-in., RB = 1.75-in.), and an angle of 30° to the horizontal, the theoretical minimum speeds are 264 rpm for case 3 and 544 rpm for case 4. These are respectively double and 4 times, the theoretical minimum speed for horizontal pouring. From inspection of the above quoted formulae, it is apparent that as the mold is inclined from the vertical, the theoretical minimum spinning speeds can be reduced by the factor $\sqrt{\sin A}$, A being the angle the mold makes with the horizontal.

Applying the formula for N in terms of Q already used, $N = 265.3 \sqrt{\frac{Q}{D}}$ we find that Q in the above cases varies from 4 in case 3 to 33.6 in case 2.

Just as in horizontal pouring, speeds considerably exceeding the theoretical minimum are ordinarily used for molds poured in a vertical position. It is thus readily apparent that the advantage of being able to pour into the open mouth of a vertical or inclined mold is secured only at the cost of using very much higher speeds of rotation. This so greatly complicates the task of securing proper balance in the molds and their driving mechanism, as well as that of lubricating and maintaining the bearings of the machines, as to

(*Continued on page* 190)

THE Redford CORE BLOWER

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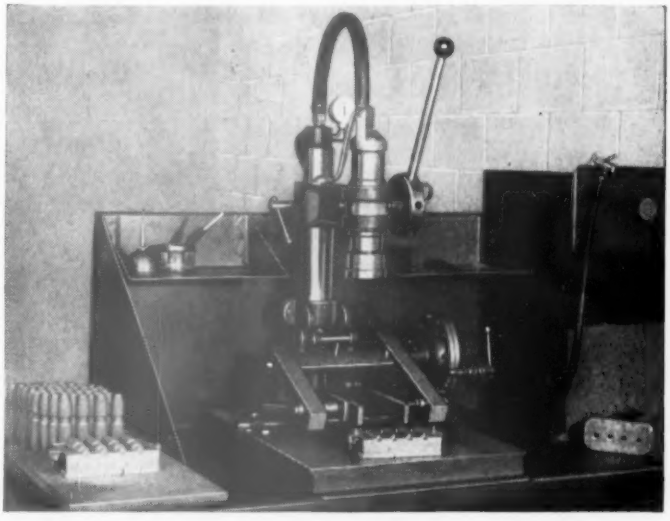

The new air operated core box clamping attachment is used for the blowing of cores in vertically split boxes. Permits clear working space on machine base—simple to install, operate and adjust—can be swung to one side to clear base for blowing horizontally split core boxes.

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(*Continued from page* 188)

lead to the use of horizontal machines in the majority of installations.

In order to create the necessary friction to keep the liquid steel rotating, there must be a certain slip between the driving and the driven material. It might be supposed therefore, that during the slow solidification of thick-walled tubes in sand lined molds, the mold would move considerably with reference to its contents. A study of the macrostructures of tubes of this sort, however, indicates that this is not the case. As is well known in the solidification of steel, crystals known as dendrites and shaped somewhat like small pine-trees, start to form at many points on the mold walls, and extend at right angles to them into the still unfrozen metal in the interior of the mold.

Dendrites Extend from Outer Wall

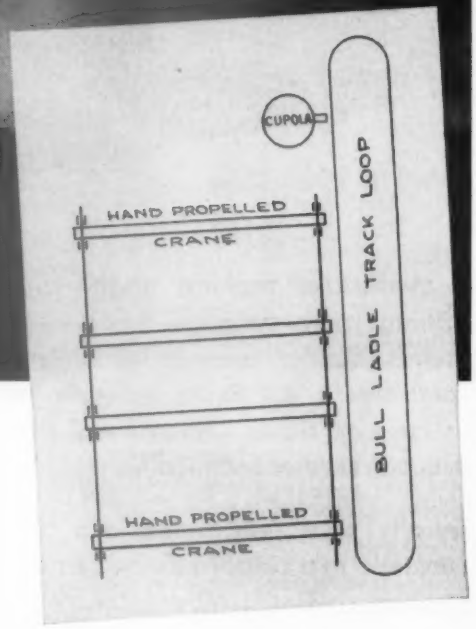
As the dendrites grow, side branches form at right angles to their main stems, and other "twigs" in turn shoot off from these side branches. In pieces that solidify undisturbed in stationary molds, these dendrites extend to a considerable distance from the outside. The inner portions of the casting and the extreme outside, as a rule are free from dendritic structure, as the first and last portions of the steel to freeze, solidify from a great many points at once, and hence, the crystals there are equi-axed instead of elongated. Acid etching of a polished cross-section of the steel reveals the dendritic structure.

In practice it has been found that the dendrites formed in heavy-walled tubes cast by the true centrifugal method in sand-lined molds extend almost to the full thickness of the walls, and though they do not lie in a true radial direction, as they would in a static mold, yet they are only slightly inclined from it. Were there any considerable slipping of the solidified layers over the still unfrozen steel inside them, such large continuous dendrites could not be produced, because as fast as they started to form they would be broken off by the wiping action between the frozen and the unfrozen steel. For all practical purposes, then, the mold and its contents are static with reference to each other, and the steel solidifies very much as it would if it were not actually revolving.

Tubes that are cast in sand by the true centrifugal process, and so thick that solidification takes place in part from the inner surface, there-

(*Continued on page* 193)

SYSTEMATIZE POURING THE TRAMRAIL WAY



A pouring floor systematized with a Cleveland Tramrail overhead system. The track loop enables two or more bull ladles to quickly convey metal to the pouring ladles without interference. Workers in photo are positioned to receive metal from bull ladle.

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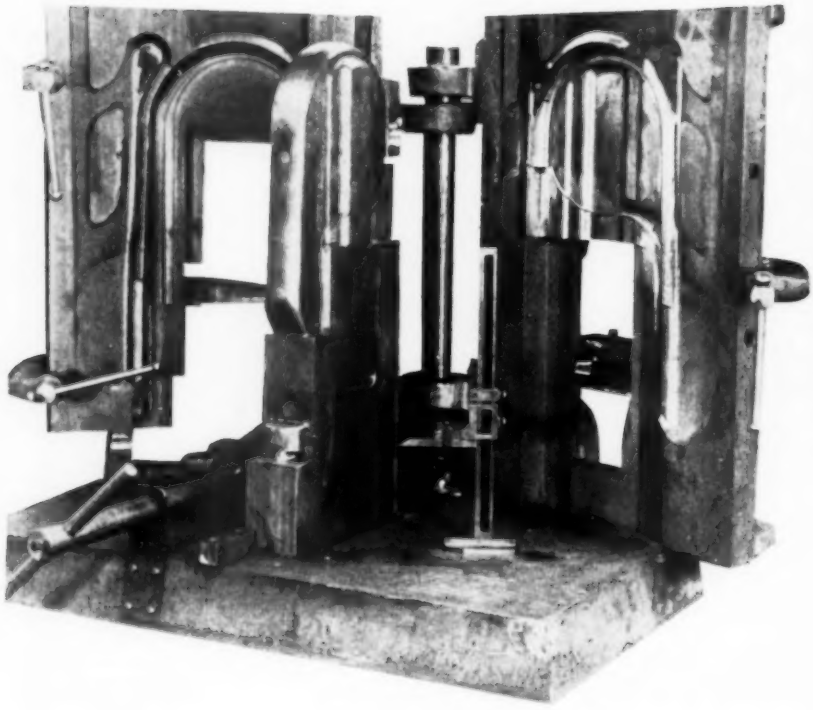

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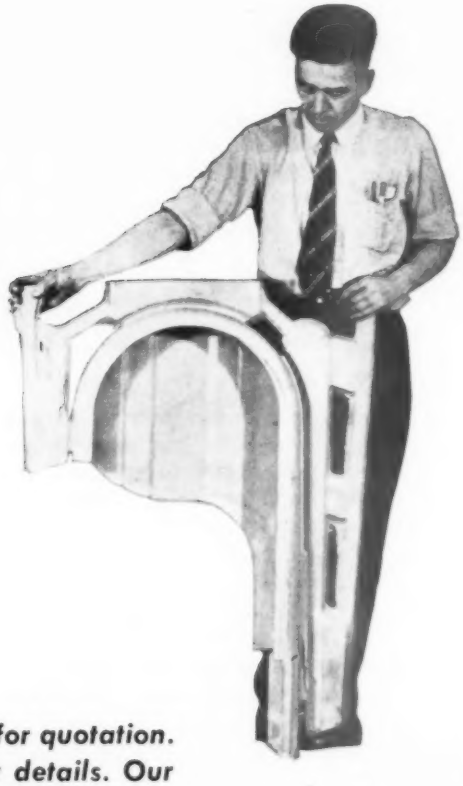

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DESIGNERS AND MANUFACTURERS OF PERMANENT MOLDS, WOOD AND METAL PATTERNS AND MODELS

(*Continued from page* 190)

fore, necessarily have a zone in them at which the long dendrites extending from the outer surface meet shorter ones growing into the remaining liquid steel from the inside surface. The contraction of the last liquid to freeze necessarily gives rise to voids between the ends of the interlacing dendrites, exactly as it does in a thin plate cast statically. The resulting "center-line shrinkage", which usually will lie nearer the inner wall of the casting, cannot be prevented from forming.

It might be supposed that by greatly increasing the speed of rotation when the steel had nearly all solidified, it would be possible to expand the solid inner layers and thus put pressure upon the last-freezing metal and prevent the formation of the shrinkage cavities. The inner layers, however, are too stiff when the last metal freezes to be thus expanded even by very great increases in speed, especially as center-line shrinkage is never a continuous open zone, but rather consists of a number of disconnected openings between the ends of adjoining dendrites. That it is impractical to prevent the formation of the center-line shrinkage in this manner, is readily appreciated when one calculates the pressures due to centrifugal force in any part of the casting. In the article already quoted, Carrington[6] gives the following formula for the pressure at any point within the casting;

When Rx = radius at the given point
Rc = radius at inside of tube
N = rpm
Wt. = Weight of a cu. in of fluid steel, (0.255 lb)

Then,

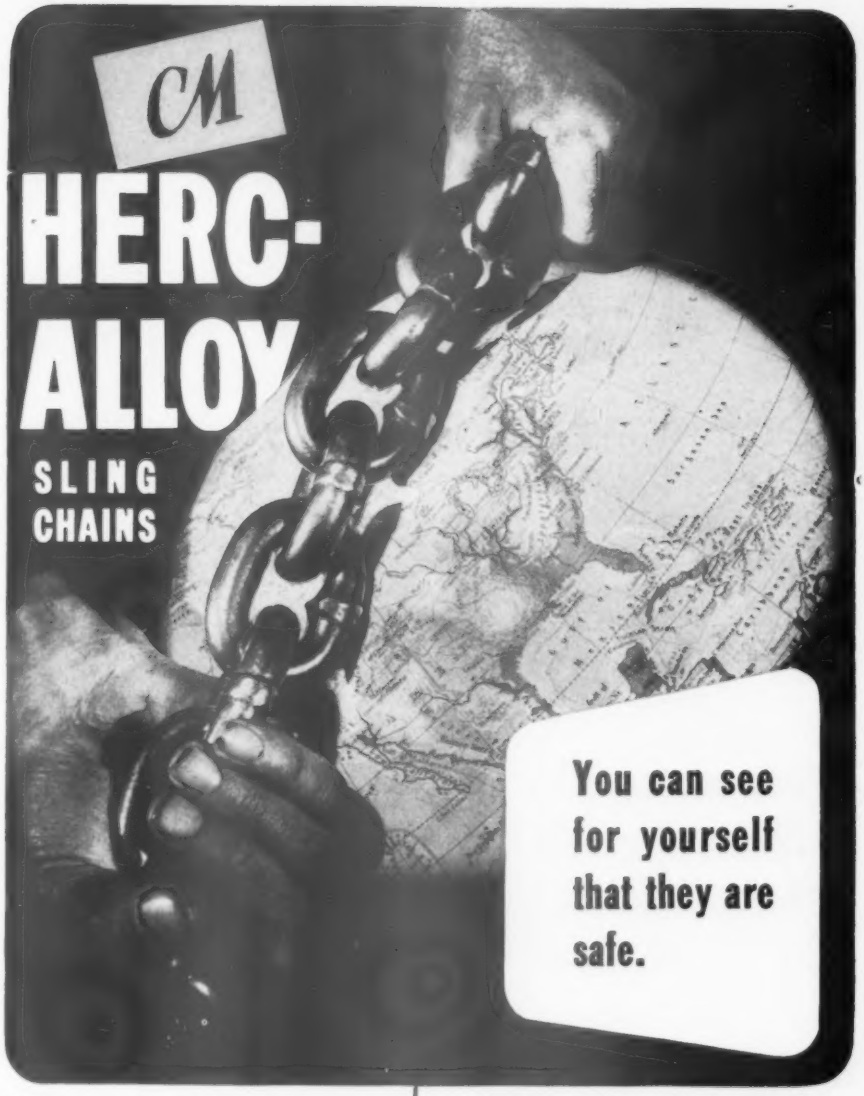
$$\text{Pressure at given point} = \frac{(Rx^2 - Rc^2)\ N^2 (Wt)}{70383}$$

In the case of a tube with outside diameter of 12-in., inside diameter or 2-in., let us suppose that the last metal to freeze is located at a point 1 in. from the inside surface of the casting, as shown in Fig. 5. For a sand-lined mold spun at a rate to give a Q at the periphery of 75, rpm will be 663. Then the pressure at the point where the last metal is solidifying will be,

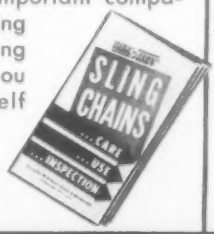
$$\frac{(2^2 - 1^2)\ (663^2)\ (.255)}{70383}, \text{ or } 4.78 \text{ psi.}$$

Even were the speed increased fourfold, so that the mold would be revolving at 2652 rpm, this pressure would be multiplied only by 16, and

(*Continued on page* 197)



● Just one of the big advantages of HERC-ALLOY Sling Chains is that you can determine their serviceability by a simple visual inspection.* Ordinary steel or iron chains, on the contrary, grow dangerously brittle with age... an insidious threat to the safety of men and materials. That's why more and more of the important companies are standardizing on HERC-ALLOY Sling Chains...because you can **see** for yourself that they're safe.



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- Every CM HERC-ALLOY Sling Chain is alloy steel throughout...links, rings, hooks. There is only one grade...*the best.*
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- Links are side welded for maximum strength by patented INSWELL electric method.
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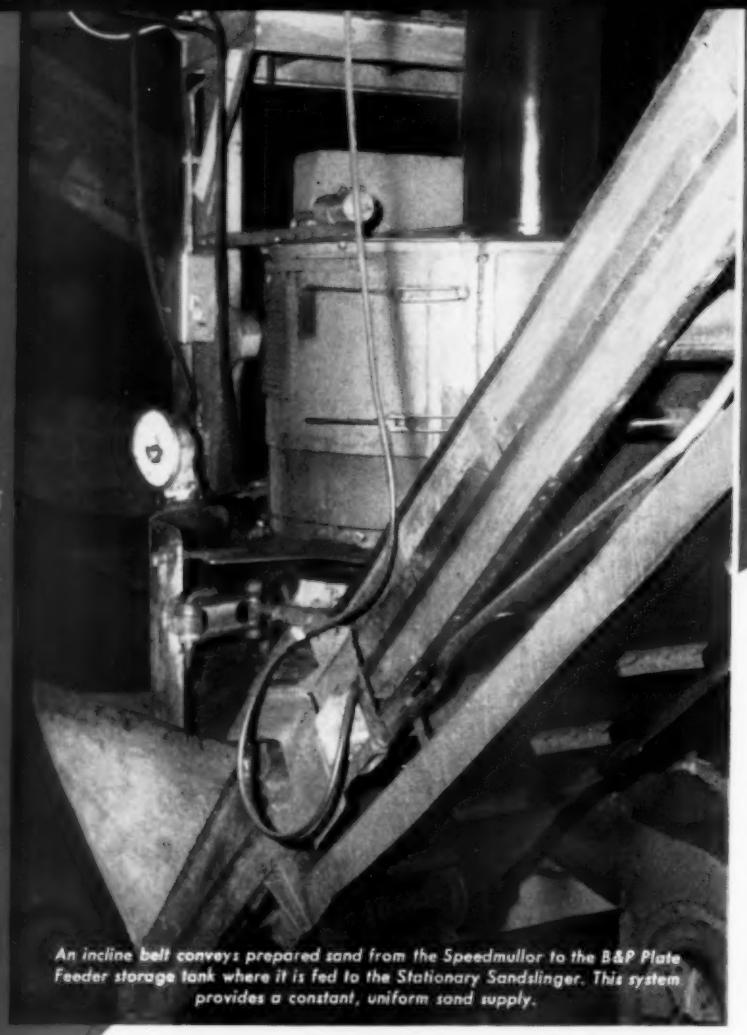


An incline belt conveys prepared sand from the Speedmullor to the B&P Plate Feeder storage tank where it is fed to the Stationary Sandslinger. This system provides a constant, uniform sand supply.

milling and ramming

BETZ FOUNDRY

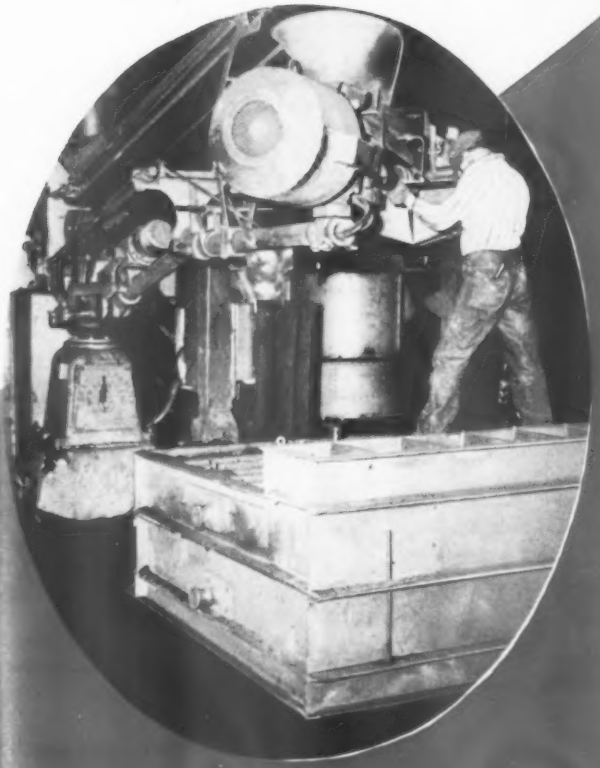
SMALL BUT PROGRESSIVE
DOES A BIG JOB WITH A

B&P

A boon to production, this Sandslinger! At Betz, a mold for a machine tool bed casting is rammed in 27 minutes. Previously, when the sand was shoveled by hand and air rammed, it took 7 hours.

A man of foresight with an eye to better methods . . . that's Karl Betz, president of Betz Foundry Company, Grand Rapids, Michigan. One better method is his B&P Speedmullor—a must for the progressive foundry. Betz's Model "50" thoroughly mulls a batch (7½ cu.ft.) of sand in 1½ minutes—with one operator. Compare this with his old mixer that took 15 minutes per batch and three men for the operation. Betz also has a Stationary Sandslinger—the better method of ramming. Now this foundry uniformly rams approximately one-half ton of sand per minute into molds of various sizes and shapes. Gone is their slow, costly hand shoveling and air ramming!

SPEEDMULLOR AND SANDSLINGER



There are 6 sizes of Speedmullors, with or without skip-hoist, air cooling, fines removal; completely automatic operation. Sandslingers are furnished in many sizes that are motive and stationary. Write today for catalogs on Speedmullors and Sandslingers.

The increased production per man-hour with the Sandslinger at Betz resulted in a cost reduction on large castings of approximately 33⅓%. Scrap was reduced and casting quality improved.

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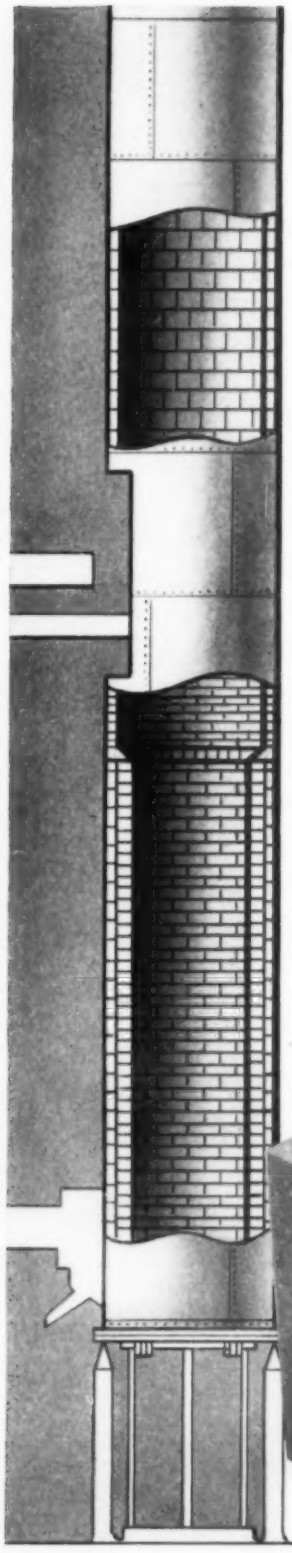
Beardsley & Piper are manufacturers of the Sandslinger • Speedslinger • Hydro-Slinger • Speedmullor • Melbare • Screenerator • Junior Hite-Gang • Preparator • Champion Speed-Draw • Plate Feeders • Turntables • Gyratory Screens



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FASTER HEATS — You get more heats — more tonnage — with Robinson Cupola Block! Because Robinson builds into its cupola block the *uniform* superior quality that it takes to withstand higher temperatures!

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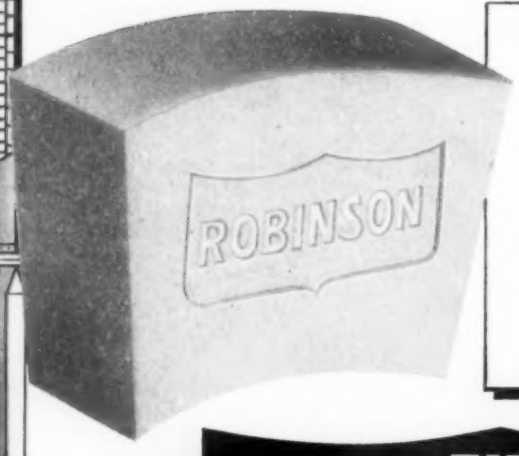

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(*Continued from page* 193)

thus would be 76.5 psi. As pointed out by Wright and Caine[6], the classic work of H. F. Hall in England has shown that steel develops a strength of at least 100 psi within a very few seconds after solidifying, so that it is quite impossible that the pressures developed by spinning at anything less than astronomical rates could possibly cause the solidified inner layers to expand and thus prevent the formation of internal shrinkage.

It is obvious, too, from the above equation, that the pressures in the solidifying casting, though quite high at the periphery, become very low, approaching zero, near the inside wall. Thus in the above case, the pressure at the extreme outer fibre of the piece, is $\frac{(6^2-1^2)\ 663^2\ (.255)}{70383}$ or 55.7 psi, but at a point ¼-in. from the inner wall of the tube is only $\frac{(1.25^2-1^2)\ 663^2\ (.255)}{70383}$ or 0.385 psi.

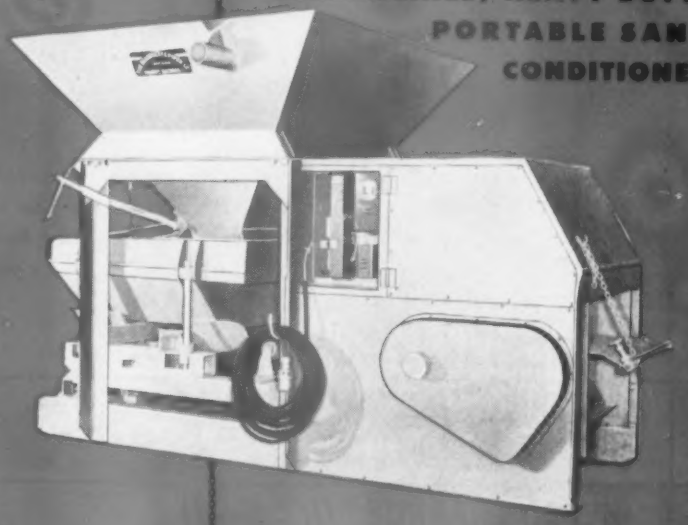
Incidentally, the formula $N = 265.3\sqrt{\frac{Q}{D}}$ shows that at the inside surface of this tube, revolving at 663 rpm, Q is 12.5 times gravity, so that the metal will not "rain" from the inside of the casting at this rate of revolution.

When the wall thickness of a tube of this sort is not great enough to cause final solidification to take place from both outside and inside surfaces, the casting will be free from true center-line shrinkage. However, as is now quite well known, in any heavy mass of steel that solidifies slowly, there are numerous minute cavities known as "micro-shrinks", located where the side branches of adjoining dendrites meet, and caused by the contraction of the very last particles of steel to solidify. There is at present no known way to prevent the formation of these tiny discontinuities, since they are formed in masses of steel cast stationary, whose macro-shrinkage, so to speak, is taken care of by adequate sinkheads, padding and other well-known means of securing controlled directional solidification.

To prevent the formation of micro-shrinkages where adjoining dendrites intersect, it would be necessary somehow to provide a source of unfrozen metal that would reach the tips of the dendrites just at the right moment to fill the cavities formed by the contraction of the last few drops of steel to freeze. Such a condition is impossible of attainment, as it in effect demands that all the steel

the new PREPARATOR

STREAMLINED, HEAVY DUTY, PORTABLE SAND CONDITIONER



Load centered trunnions on the Preparator provide perfect balance when moving the machine by crane to desired locations. The rigid construction of the frame assures normal operation of the machine even though it is placed on irregular or uncleared foundry floors.

The Preparator will do a complete job of preparing and tempering your molding sand! It thoroughly screens, breaks lumps, magnetically separates and aerates. Designed to best withstand the most severe conditions to which equipment of this type is often subjected. Heavy dust tight enclosures provide maximum protection to the operating mechanism.

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should solidify without there being any last-freezing particles whose contraction produces the cavities. Whenever there are large dendrites in the steel, therefore, micro-shrinkages are present, and can be found by careful examination of a polished cross-section of the piece, or by acid etching or magnetic powder examination of such a surface. The walls of slowly solidified heavy tubing cast centrifugally are no exception to this general statement.

How important these micro-shrinkages may be depends almost wholly upon the kind of service in which the casting is to be used. There is very little doubt, for instance, that in a tube of this sort, a micro-shrink may prove to be the starting point of a progressive failure under the severe repeated stresses to which axles or shafting are sometimes subjected. Drastic heat treatments such as quenching and tempering, too, may enlarge some of the micro-shrinks, especially if the piece is quenched until cold before being placed in the tempering furnace. If this occurs, the strength of the piece will be considerably reduced. On the other hand, in the majority of cases it is quite probable that the existence of these defects will entirely escape attention, and that their presence will not seriously reduce the effectiveness of the casting in service.

(To be continued)

Gray Iron Founders Plan Meeting

Gray Iron Founders' Society has arranged an interesting and informative business program for its 20th annual meeting, to be held at Haddon Hall, Atlantic City, N. J., Thursday and Friday, Oct. 14-15.

The tentative program calls for reports of officers and various committees to be presented at the opening session Thursday morning. At an industry luncheon that noon the speaker will be William B. Given, president, American Brake Shoe Co., New York. The afternoon session will consist of a symposium on foundry hygiene, with three authoritative speakers discussing various phases of the subject. A social hour is scheduled for Thursday evening.

Various subjects will be covered at the Friday morning business session, some of the topics including the pig iron situation, profit sharing and the free enterprise system, and an educational program for foundry personnel. Presentations of citations and awards will be made at the concluding Friday noon luncheon.

the grinding job

Rough grinding to remove surface imperfections from large steel castings with a Fox Swing Frame Grinder operating at 9,500 surface feet per minute. This is a production grinding operation requiring heavy, fast stock removal. For maximum production at low cost, long efficient wheel life is essential.

the wheel

Borolon resinoid bonded A126-S7-B1, size 24" x 3" x 12" with Red Streak Flanges. Embedded into sides around center hole and lining a portion of it, these patented flanges give better spindle fit (steel against steel); truer running; better balance; longer life. With no abrasive wear on machine parts, grinder maintenance is less.

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Grinding Wheels

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Simonds Abrasive Distributors in all principal industrial centers of the U. S. and in many foreign countries carry stocks and can advise on grinding wheel selection. Write today for informative Bulletin ESA-154 on Snagging Wheels and Red Streak Flanges. Also for name of distributor nearest to you.

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Quality control has characterized Simonds Abrasive Company products during more than 50 years as a major manufacturer of grinding wheels and abrasive products exclusively. This control begins with the abrasive grain produced in modern electric furnaces by Simonds Canada Abrasive Co., Ltd., and extends to the finished wheels for all types of grinding from roughing to precision finishing. This means consistently high wheel performance on every grinding job.

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THE ADVENTURES OF *Bill*

By PAT DWYER

Drawings by RICHEY

PERCHED lazily the other night in my garden chair—a noble piece of furniture cunningly constructed from hunks of wood in the natural state by some unknown artist handy with the tools—I watched Bill rolling across the lawn. He did not roll in the sense that a barrel, full or empty, a boy's hoop, or a bloom shooting through the great rolls in a mill, does the rolling act. Toes turned in. Knees turned out, body bent forward at a more or less obtuse angle, and with arms hanging loosely as if in readiness to grasp some stationary support, he ambled forward. I began to suspect a slight marine odor when he raised one hand in salute and remarked casually "Come on board, Sir!"

"Don't tell me," I said, "let me guess animal, vegetable or mineral. In your good-natured, if somewhat clumsy manner, you are trying to remind me of a game we played now and again in the brave days between 6 and 12. Age that is, and not clock time. One member of the group went through certain motions which he imagined represented a trade or occupation. From the evidence submitted, the other members of the group guessed the answer. In this particular instance I'll venture the guess you are trying to impersonate a sailor. That is as far as I care to go. Even a prize of a cobbler's kit or an oversize ice cream freezer would not tempt me to speculate on the motive which prompted you to put on such a—well, such a performance. If you think for a minute that I am silly enough to ask for an explanation, you are in a more hopeless condition than the lady in the old-time song who at the top of her voice informed one and all that she was more to be pitied than centchured.

"The song practically was gone and forgotten by the time I had reached the stage of general handy man to certain young people who brought home stacks of home work from the school each night, and who paid me the implied compliment of letting me handle the job. While hunting references in a frenzied attempt to keep even a short distance ahead of the pack, I discovered that the lady never had been in real peril. Either that or the late Mr. Webster had been singularly remiss in compiling his well known best-seller. The word "centchured" does not appear on any of the chaste pages. 'Twas then for the first time I learned that the word the song writer had in mind is spelled in three different ways, all pronounced alike, but with different meanings. A censer is a device for burning incense. A censor is one self-appointed or appointed by the public to give the stop or go sign to any item affecting the morals or manners of a community. A censure is an adverse judgment on the actions or opinions of individuals or groups. If one was to go a little deeper into the subject—"

"If you let go your grip on the life line, you will find that you are out of your depth in a very large and chilly body of the stuff known as H_2O in the good old days you were gabbing about a minute ago. And that includes yourself, the screeching lady yodeler and the old boy who compiled the dictionary, old Bro Webster and I ain't going to guess if his first name was Noah or Dan'l.

"Your first shot was not so wide of the mark. Every now and again I feel kind of gratified to note that you are a little sharper even than I had hoped in the most charitable mood. Just goes to show the effect of associating—Ahem—with one of the bright ones. Stick around, me boy and eventually—"

"I know. I know. Eventually I shall be like one of the two characters in the knock-'em-in-the-aisles introduction to the after-dinner story. An engineer is said to be a man who knows a great deal about very little. He goes along knowing more and more about less and less until finally he knows practically everything about nothing. On the other hand an editor is a man who knows very little about a great deal and keeps on knowing less and less about more and more until finally he knows practically nothing about everything."

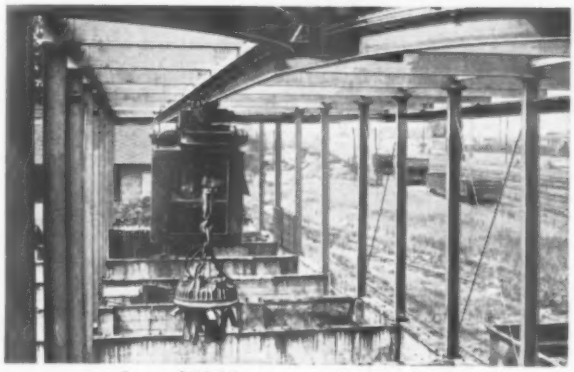
"All right then. So now you are one of the two characters. Therefore congratulations are in order. You guessed my identity without any prompting. Barnacle Bill the sailor, no less, just back from a life on the

(*Continued on page* 202)

The boys enjoy a little innocent recreation, dividing the loot acquired by considerable physical danger and exertion

MOVE HEAVY LOADS ON MONORAIL

FOR LOWER COST HANDLING



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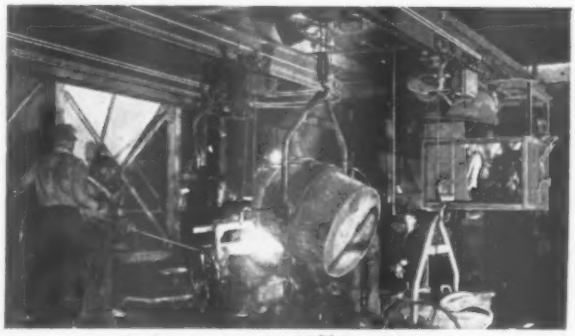
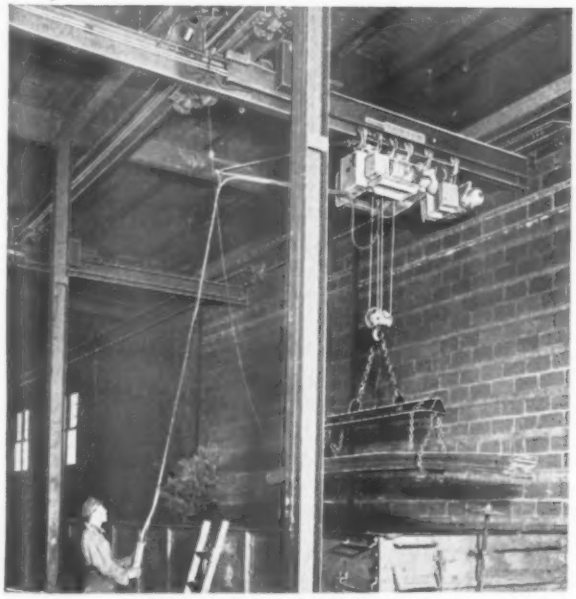
Saves 32c per ton handling rod.



Delivers metal with 60% less labor.



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Any system, regardless of how complicated, will pay for itself in time and money saved. One company reports a savings of 86% in handling costs.

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- Cuts Sprues and Gates of Non-Ferrous Castings with ONE SWIFT, SURE STROKE.
- Does away with slow, tedious hand labor . . . releases valuable manpower for other work.
- Results in a fast, steady flow of work through the cleaning department.
- Eliminates accumulations of unfinished work; castings are trimmed and cleaned as they come from the foundry. Less storage space needed.
- Skilled operator not needed . . . any workman can learn quickly to run the Milwaukee-Tessmer Sprue Cutter at top capacity.
- It's built for years of Rugged Service and Low-Cost, Trouble-Free operation!

MODEL "H"
with Direct Motor Drive

Milwaukee-Tessmer Sprue Cutters are built in two models which differ only in size and cutting capacity. Both are regularly powered with electric motors and have built-in speed reducers. When furnished without motors, flywheels have plain crowned surfaces for flat-belt drive.

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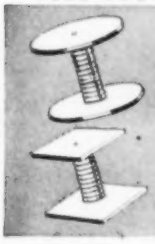


MILWAUKEE CHAPLET

A 5216-2½R

(*Continued from page* 200)

ocean wave, a home on the rolling deep, where the scattered waters rave and the winds their revels keep. Yo-ho-ho, and a bottlarum!"

"Seems to me you are taking liberties with the works of two authors. The life on the ocean wave fella is scrubbed clean as a new penny. His cheeks are glowing with health and his muscles bulge correctly at every point they are supposed to bulge. His pantaloons, sweater and flowing black tie would pass him through the doors of the most select yacht club. The bottlarum lad with ragged pants, torn shirt and an old handkerchief for head gear brings to mind Stevenson's Long John Silver and the old Walrus back from a brisk bit of pirating here and there, Surinam,

Bottlarum in nearly every story

Malabar, Providence and Portobello.

"I never have seen a definite statement on the subject, but it is reasonable to infer that these hardy lads never changed their clothes or bathed. Pickled in brine and soaked in sweat from their daily violent exercise they suggested to the ordinary citizen the advisability of passing—and as far as possible—to the windward side.

"Since you have none of these characteristics, costumes or mannerisms, and if the subject is not a state secret, might I inquire on which of the numerous oceans you spent a life on the ocean wave and a home on the rolling deep?"

Bill wagged an admonitory finger. "You should not jump to conclusions," he pointed out. "This cruise from which I have just returned was on the Great Lakes. I'll tell you about it some other time. First I want to show you an inquiry I found on my desk the very first day I put the old nose on the grindstone. I

(*Continued on page* 204)

ONE PIECE FORGED TOOL STEEL

MOULDERS TOOLS

Immediate Delivery From Stock . . .

No. 1
SLICK & OVAL SPOON

Width	¾″	1″	1¼″	1½″
Each	$1.05	$1.15	$1.40	$1.55

No. 5
OVAL SPOON & TAPER SLICK

Width	¾″
Each	$1.15

No. 10
TAPER & SQUARE

Width . . . ¾″ Taper, ½″ Square
Each $1.15

ROUND FINISHING TROWEL

Width—1½″	x	6″	$1.80
1½″	x	7″	1.85
2″	x	7″	1.90

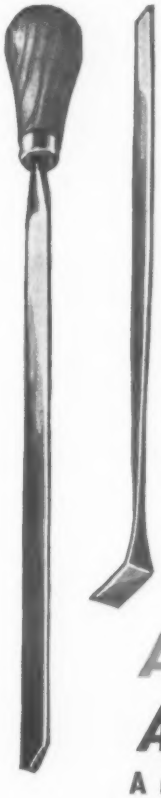
No. 15
BENCH
LIFTER

Width	¼″	½″	¾″
Each	$1.05	$1.15	$1.40

MOULDERS VENTING TOOL

For Steel and Semi-Steel Foundries

Length	16″
Width—⅜″	$1.20
½″	1.35
¾″	1.50



SQUARE TROWEL

Width—1½″	x	6″	$1.80
1½″	x	7″	1.85
2″	x	7″	1.90

No. 40 STRAIGHT LIFTERS

Length	10″	12″	14″	16	18″
Width—¼″	$1.05	$1.15	$1.20	$1.30	. . . .
⅜″	1.05	1.15	1.20	1.30	. . . .
½″	. . . .	1.30	1.35	1.40	$1.55
¾″	. . . .	1.40	1.50	1.60	1.75

Special Lifter, ½″ wide x 24″ long—$2.50

A New Product!!

ABRASIVE CORE FILES

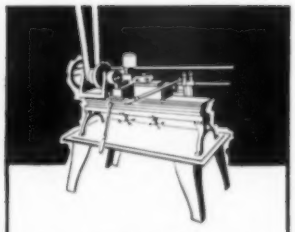
A real help in your core room. They are far superior to steel files. Send for complete literature now.

The Freeman Supply Company

Pattern Shop & Foundry Supplies & Equipment

Mahogany and Pine Pattern Lumber

1152 East Broadway **TOLEDO 5, OHIO** **Tel. TAylor 4624**



The first successful turret lathe and the first Roots Blower were built in the same year . . . 1854. We're not good because we're old, but old because we're good.

CUPOLA OUTPUT DEPENDS ON A DIET OF AIR

(Photograph by courtesy of Inland Steel Company, from motion picture "The Drama of Steel".)

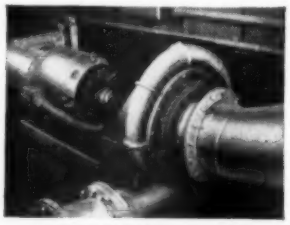
With cupola output so dependent upon adequate, reliable air supply, you'll feel more comfortable about production schedules when Roots-Connersville Centrifugal or Rotary Positive Blowers are on the job.

You'll especially like our *dual-ability* to supply either type, whichever best meets your service requirements. This R-C *dual-ability* permits our engineers to make completely unbiased recommendations. Further, it enables you to concentrate your blower purchases in one source, with full assurance of complete reliability and long-time, economical performance.

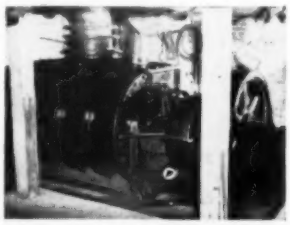
If you have not already received our new Bulletin No. 120-23-B11 on Foundry Cupola Blowers, write us for your copy.

ROOTS-CONNERSVILLE BLOWER CORPORATION

808 Madison Avenue, Connersville, Indiana



Single-stage R-C Centrifugal Blower for foundry cupola service, with a capacity of 6,000 CFM.



According to recollection of oldest employees at foundry where this R-C Rotary Positive Blower is installed, it's been giving dependable service for more than 38 years.

ROOTS-CONNERSVILLE ROTARY CENTRIFUGAL — BLOWER BUILDERS R-C SINCE 1854

BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

• • ONE OF THE DRESSER INDUSTRIES • •

(Continued from page 202)

have a copy of the correspondence here some place:

Due to the type of raw materials available we have not been able to pour cupola gray iron containing less than 0.50 per cent phosphorus. According to the AFS *Cupola Handbook* page 54, Table 4 a, there is neither loss nor gain of phosphorus in cupola melting. During a recent shop session the question arose as to whether it is possible to dephosphorize gray iron. Has any commercial process been developed whereby gray iron can be dephosphorized in the cupola. We shall appreciate any information or any comment on the subject.

"Seems to me," I said, "your correspondent has backed you into a kind of a tough corner. Now and again I have seen some brief reference to attempts to reduce the phosphorus content, but they all have been connected with the production of converter steel."

"Well," Bill said, "I'll tell you. I laid the problem before a brilliant and obliging friend who knows practically everything. Anything he does not know the answer for offhand, he knows exactly where to look for it in a collection of publications, clippings and references, as long as the tail of Halley's comet and all housed very handsomely in the drawers of a filing cabinet, about as high as a tall man's chin."

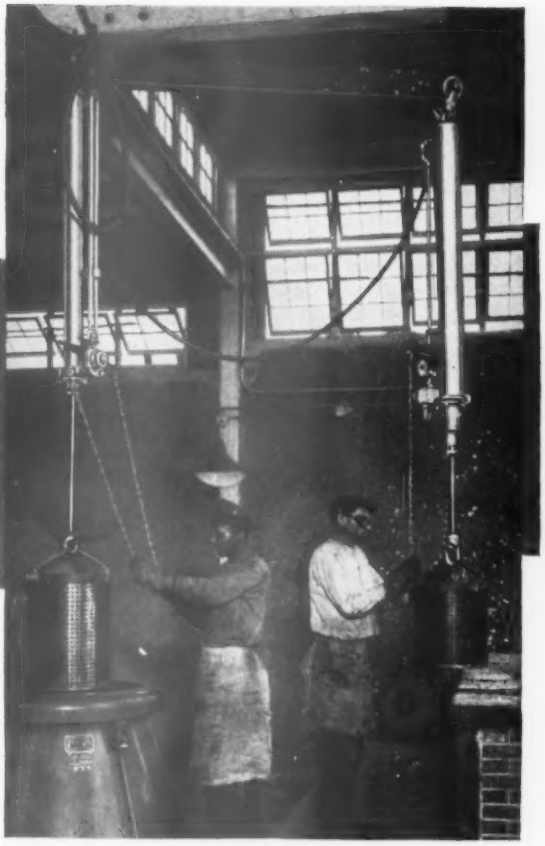
I mildly protested that the description was too indefinite. He should specify whether the tall man's feet were bare, wrapped in gunny sacks or straw ropes like a core barrel, or encased in high-heel shoes. Was the man standing erect, leaning at an angle, down on all fours like a racer waiting for the pistol, or lying stretched out on the ground like the good and faithful servant at the close of day. Unless one or all of these features were duly cataloged, not even two strong men working over time could venture a guess at the man's height. I assured Bill I did not doubt his word in the least, but he really should watch his language. I could and would make proper allowance, but some day he might fall in with men without my easy going attitude and charitable disposition.

Bill waved his hand in careless dismissal of this noble effort. "If and when," he said, "I am ever unfortunate enough to run into a bird—as my old uncle Malachi used to say: The saints be betwixt us and all harrum—a bird with fewer marbles than you have, I shall get out my little *abc* primer and feed the stuff to him in canary bird doses. From the general tone of my corre-

(Continued on page 206)

Get More Production Per Man with . . .

CURTIS AIR HOISTS



The speed, ease of handling and accurate control of Curtis air-powered Hoists and Cylinders step up production.

Wherever a lifting, pulling or pushing operation is involved, CURTIS Air Hoists save time and labor; cut load-handling costs.

Curtis Air Hoists provide:

- Low original cost
- One-man operation
- Immunity to abuse by overloading
- Capacities to 10 tons
- Light weight
- Lowest operating expense
- Finger-tip control
- Pendant, bracketed or rope-compounded types

Send for Bulletin C-7 on Curtis Air Hoists, Air Cylinders and Air Compressors.

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94 Years of Precision Manufacturing

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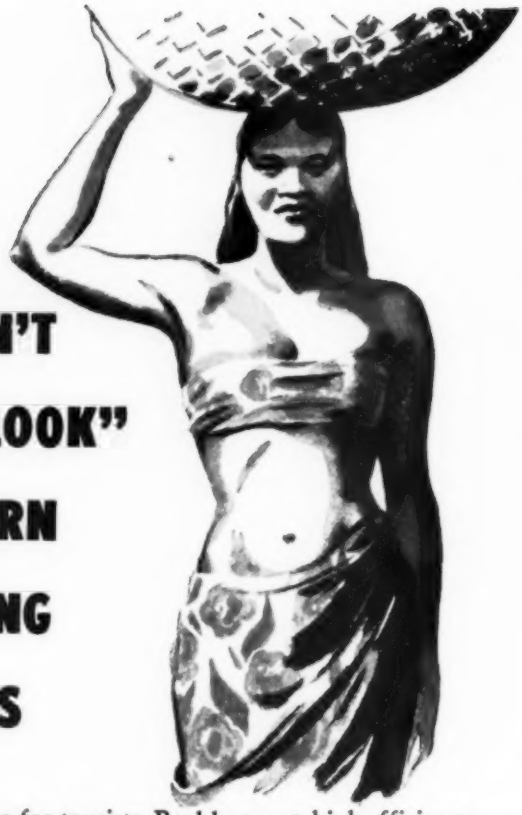
Please send me Form C-7 on Curtis Air Hoists, Air Cylinders and Curtis Air Compressors.

Name.....

Firm.....

Address.....

City..... Zone..... State.....



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This is strictly atmosphere for tourists. Real low-cost, high efficiency in material handling calls for Standard Conveyors . . . as sections, systems or portable powered units. Standard Conveyors are built to handle everything from metal bolts to cotton bales. They put manpower where it belongs—on the production line. To make substantial savings in your shop or warehouse, find out how Standard Conveyors can be used for all kinds of material handling, piling or moving. Standard Conveyor Co., General offices: North St. Paul 9, Minn. Sales and Service in Principal Cities.

FREE HELPFUL LITERATURE
Send for Standard's Catalog. See how conveyors are used in every field of industry. Ask for Bulletin No. F-88

Standard
GRAVITY & POWER
CONVEYORS

(*Continued from page* 204)

spondent's letter, I figured that there was no need of traveling under wraps. He can add up two and two and make four out of 'em. Therefore I had no hesitation in referring him to two Institute of British Foundrymen committee reports which my filing cabinet friend snatched out of a drawer with all the ease and nonchalance of a magician lifting a big, kicking rabbit out of a perfect stranger's hat, or out of his own sleeve or vest pocket. If you will be good enough to pay attention, and stop biting your nails, I shall read you from a copy of my reply:

"During the recent war the Institute of British Foundrymen carried on extensive experiments on the problem of removing phosphorus from molten iron. Result of the work is published as Report No. 1, Paper No. 858 and Report No. 2, Paper No. 803. Copies presumably may be still available and may be ordered from the Institute of British Foundrymen, St. John Street, Chambers, Deansgate, Manchester 3, England. It may be that copies are in the files of your local AFS chapter.

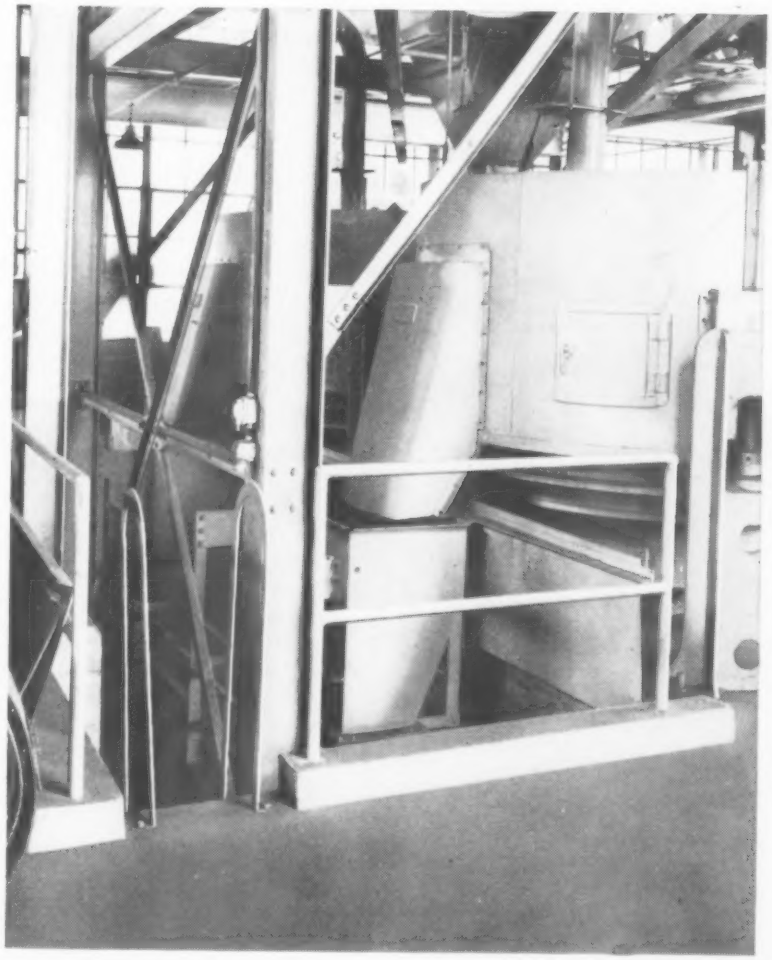
"The following conclusions from the second report seem to indicate that the results have not been entirely satisfactory. The experiments described above confirm the claim that some dephosphorization can be obtained during melting in a basic-lined cupola. The abnormally high pickup of carbon reported by Heiken is also confirmed and it was found that appreciable desulphurization can be obtained simultaneously with dephosphorization. With high steel charges of the type used in the cupola-converter process there is no difficulty in producing conditions under which phosphorus may be removed, but with this type of charge there is a serious danger that such conditions will result in the production of metal unsuitable for further processing.

"It is probably quite widely known that the present series of investigations into the possibility of effecting dephosphorization were initiated owing to the serious difficulties in the raw materials supply position which arose in 1940-41. In such emergency conditions it was possible to consider the operation of processes which in normal times would not be economical. The termination of hostilities to some extent has altered the position; but the sub-committee wish to direct attention to the importance to the national interest of developing a satisfactory commercial method. They regret that the cupola

(*Concluded on page* 208)

AUTOMATIC CONTROL OF SAND PREPARATION WITH THE

clearfield MIXER



You assure yourself of complete uniformity in sand preparation when you're using a Clearfield Mixer with automatic controls.

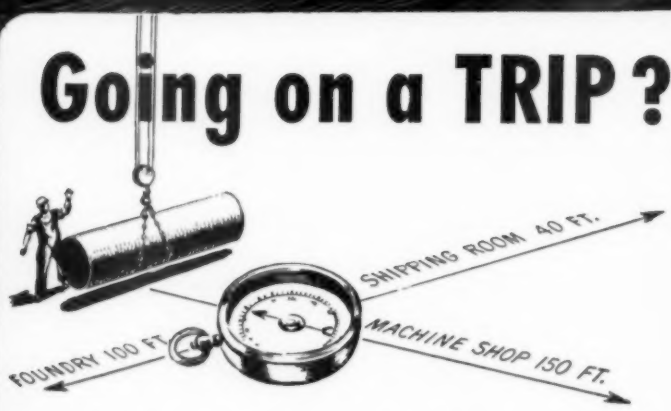
A press of a button starts the mixer. Then electric relays take over, opening and closing the storage bin gate, admitting water and bond in proper amounts, controlling the mulling time and operating the discharge mechanism. It relieves the operator of timing and guessing, eliminates human error. Controls are easily changed when another type of sand is desired.

There's a Clearfield Mixer—manual or automatic—which will meet your needs fully. Write today for catalog No. 79 for complete details.

CLEARFIELD MIXER
MIXES, TEMPERS, AERATES

CLEARFIELD MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A.

Going on a TRIP?

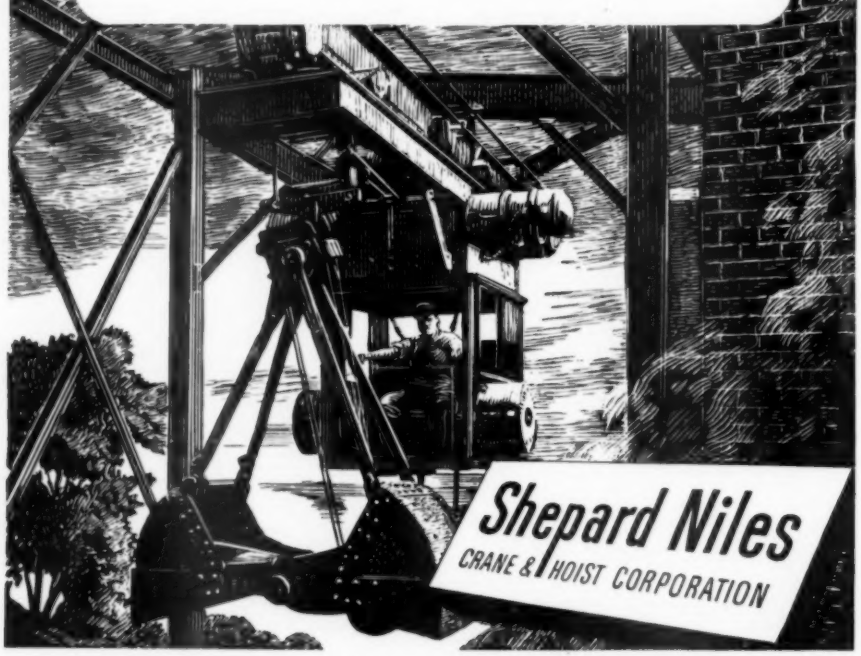


By motoring standards a trip of less than 100 feet is ridiculous, yet one such trip involving the moving of heavy materials around your plant by human muscle can easily cost more than a coast-to-coast automobile tour.

When material-moving costs must be kept down, when speed is important, when safety is concerned and when day-in, day-out, trouble free operation is required — the answer is a Shepard Niles monorail hoist. And the recommendation of a trained, experienced Shepard Niles engineer is invaluable in helping you get the electric hoist best suited to **your** needs.

His survey of your material handling puts you under no obligation. America's oldest builder of electric hoists has a wealth of experience from which to draw. All this experience is at your service, to help you get what you need.

★ Perhaps your problem involves an overhead traveling crane, rather than a hoist. If a crane will do a better job for you, that's what Shepard Niles engineers will recommend.



360 SCHUYLER AVENUE • MONTOUR FALLS, N. Y.

(*Concluded from page* 206)

plants in which the experimental work so far reported by them has been done, are no longer available for these purposes. However, it has been shown that under carefully controlled conditions, dephosphorization is practicable. The sub-committee wish to place on record the opinion that, given further opportunity for experiment, a commercial process might be developed, and it is of vital importance to the industry as a whole that this work be proceeded with.

"The present state of the sub-committee's knowledge suggests that a manufacturing process such as they believe possible might not depend solely on dephosphorization in basic-lined cupolas. In view of their present lack of cupola facilities and on account of certain encouraging experimental results which already have been obtained, they are turning their main attention to an examination of the possibility of desulphurizing and dephosphorizing in basic-lined ladles. It is expected that their findings will be published at a later date."

Several years ago a Mr. Yocum developed a method for reducing the sulphur and phosphorus content in steel. The steel from one ladle at a height of 10 or 12 feet was poured into a second ladle containing a quantity of highly basic slag. The technical press carried a reference to the subject at the time.

Book Review

The Modern Metallurgy of Alloys, by R. H. Harrington, cloth, 209 pages, 5¾ x 8¾ in., published by John Wiley & Sons Inc., New York. Price $3.50.

Emphasizing the "whys" of alloy properties, this book correlates modern theory with practical data, including the fundamentals of a new field of alloy treatments. The author feels that there has been a lack of basic structure in knowledge in the field of metallurgy, and for that reason he felt it was necessary to go down to the roots in the field of metallurgy to get the bare facts, to recast and to simplify, and then to return to the theoretical.

He also found it necessary to formulate simple standard definitions for heat treatments, to relate these heat treatments to equilibrium diagrams, to classify logically and to name pictorially the types of equilibrium systems and solid state reactions, to try to understand why metal elements alloy as they do, and to supply in convenient form the tools for the reader's own mental engineering.

Remove Non-Ferrous Gates and Risers

Faster . . . without danger of wheel breakage!

Specify **The** *New*

NORTON NORFLEX

Cut-off Wheels

OPERATORS are very enthusiastic about these new NORFLEX Wheels. They've discovered that they cut gates and risers from non-ferrous castings fast and clean—stand up without being babied—and will not fly into pieces even if twisted or bent!

Why not protect your operators from the danger of wheel breakage and reduce your cutting costs? Order NORFLEX Wheels from your Norton abrasive engineer or Norton distributor.

For jobs where frequent breakage normally occurs, specify these NORFLEX Wheels—A241-014BN, or A241-R14BN

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NORTH • EAST • SOUTH • WEST • IT'S SCHRAMM!

CHOOSE *as others have* **THE MODEL THAT BEST FITS YOUR NEEDS!**

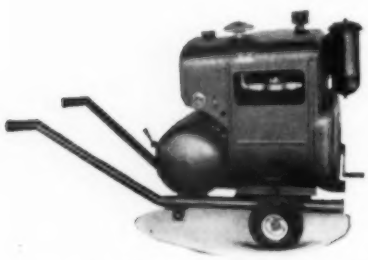
There's a Schramm Air Compressor, size and model, to meet your specific needs!

Below are listed some of the many Schramm models, stationary compressors ranging to 600 cu. ft. displacement.

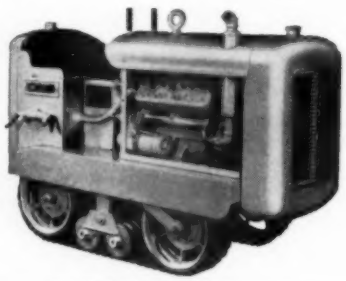
On all models performance records are evidence of their high quality. You will find the name Schramm written on every important page in compressor history.

Features you get in Schramm are: 100% water cooled, assuring ideal performance summer and winter; mechanical intake valve, forced feed lubrication. All Schramms are compact, lightweight, easy to operate.

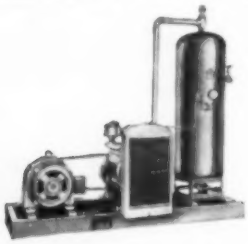
We invite you to write today for fully illustrated catalog describing in detail each of the Schramm Air Compressors shown here . . . plus a wide range of other models. We feel the Schramm story is a good one, and offers you a sure way to get your many compressed air jobs done quickly, efficiently, and economically.



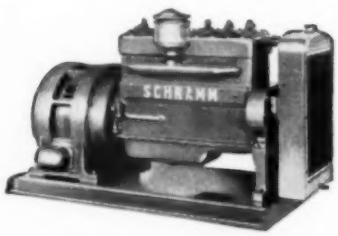
No. 20 Compressor on Shop Truck



No. 60 Self-Propelled Compressor

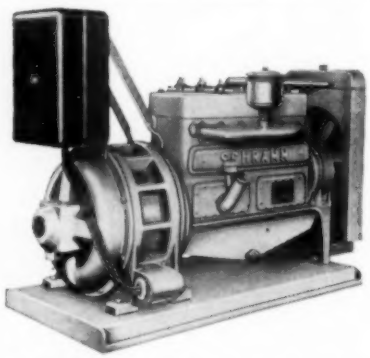


V-Belt Drive with Cooling Unit



Built-in Motor with Cooling Unit

"V" Belt on Flat Pulley Drive



Built-in Motor Drive with Cooling Unit and Starter

SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER • PENNSYLVANIA

OBITUARY

Leslie W. Kerr, 58, foundry superintendent, Bagley & Sewall Co., Watertown, N. Y., died recently. He was associated with Central Foundry Co., Newark, N. J., for 11 years, serving as metallurgist and production manager for that company. He became assistant superintendent of the Bagley & Sewall foundry in 1943, and was named superintendent in 1947.

* * *

William F. Tynes, 52, president, Hardie-Tynes Mfg. Co., Birmingham, died July 3. He began his industrial career with Westinghouse Machine Co., Pittsburgh. Mr. Tynes became president of Hardie-Tynes Mfg. Co. upon the death of his father, W. D. Tynes.

* * *

Paul J. Fabing, 50, supervisor of the finishing department of the Buckeye Steel Castings Co., Columbus, O., died in that city, June 29. He had been associated with the company 25 years.

* * *

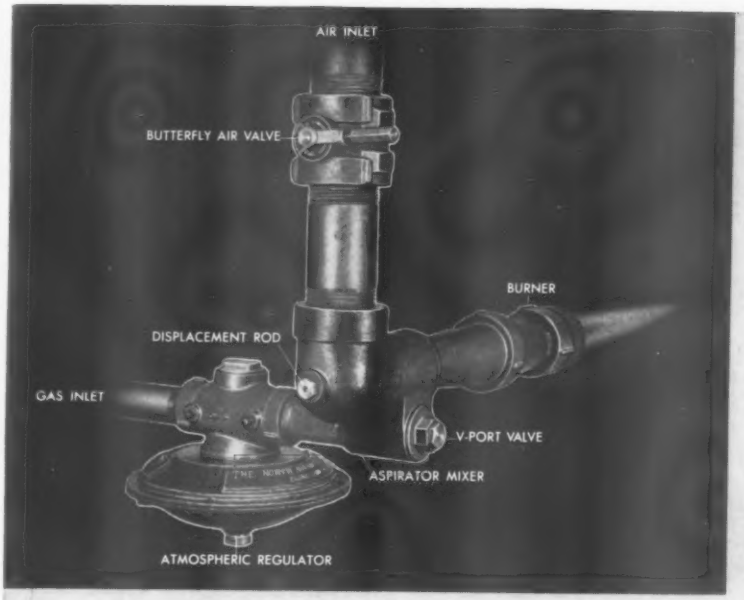
Henry T. Irwin, president, Rosedale Foundry & Machine Co., Pittsburgh, died at his home there June 8. Mr. Irwin had been associated with the machine company for the last 40 years.

Course in Quality Control Offered

University of Iowa will hold its sixth course in quality control by statistical methods, Oct. 5 to 15. These statistical methods were developed by some of the nation's leading industries with co-operation of the Army and Navy and other governmental agencies, and are particularly valuable to quality control supervisors, managers, industrial, production and designing engineers, etc. Tuition for the course including books and supplies is $100. Applications and additional details may be secured from Prof. Lloyd A. Knowler, Department of Mathematics, State University of Iowa, Iowa City, Iowa. Number of trainees will be limited.

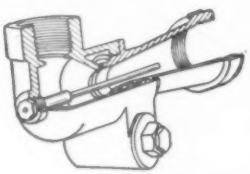
Index of Standards

American Society for Testing Materials, 1916 Race St., Philadelphia 3, just has published its *Index to* 1947 *ASTM Standards* which lists all of the 1500 standard specifications of the society by subject, and in numeric sequence. Copies may be obtained by writing to the society.



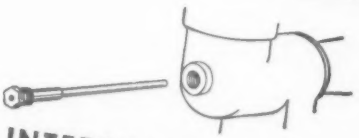
NORTH AMERICAN *Aspirator Mixers*

UNEQUALLED *for* EFFICIENCY *or* ADAPTABILITY



EFFICIENT DESIGN

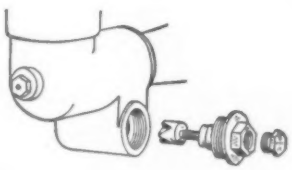
and precision manufacture of the internal parts enable the air flowing through the mixer to create enough suction to draw the gas into the mixer and deliver an intimate mixture of gas and air to the burners at high pressure.



INTERCHANGEABLE ROD

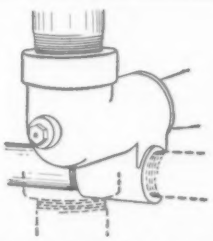
permits changing the orifices to conform to the particular conditions found in the field and still provide the optimum mixture pressure and suction ratios for the job at hand. Standard rods of varying diameters are interchanged without breaking any piping. Easily adjustable for greater mixture pressure with lower suction, or lower mixture pressure with higher suction.

NORTH AMERICAN *for* COMBUSTION



SENSITIVE V-PORT ADJUSTMENT

provides positive setting of the gas-air ratio on any gas from 500 to 3200 Btu per cubic foot (20 complete turns of the valve are required to go from fully open to fully closed).



COMPACT, FLEXIBLE DESIGN

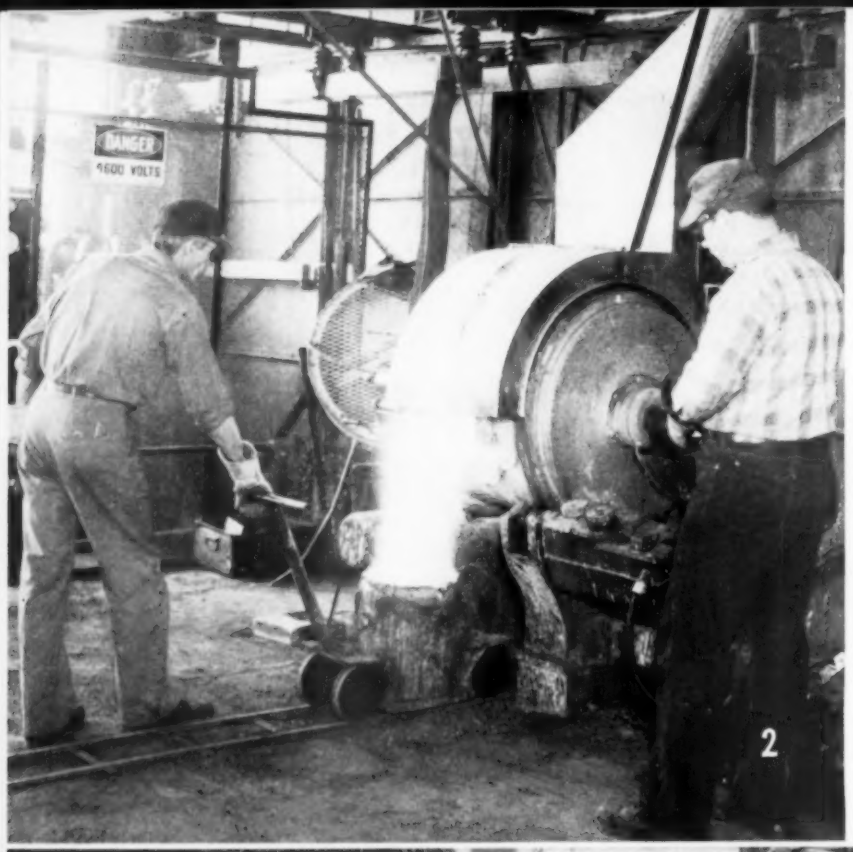
makes the North American Aspirator Mixer easy to install on any industrial furnace or oven. Over-all length not excessive.

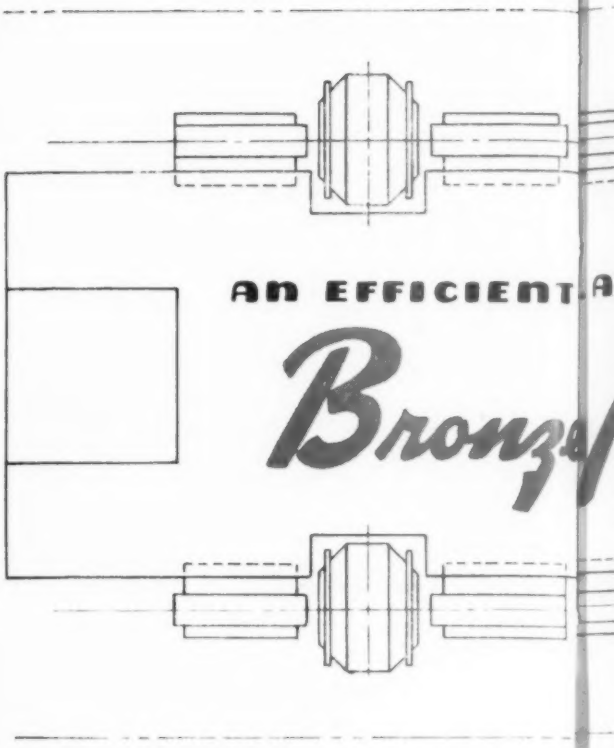
THE NORTH AMERICAN MANUFACTURING COMPANY

MANUFACTURERS OF INDUSTRIAL FUEL BURNING EQUIPMENT FOR GAS OR OIL

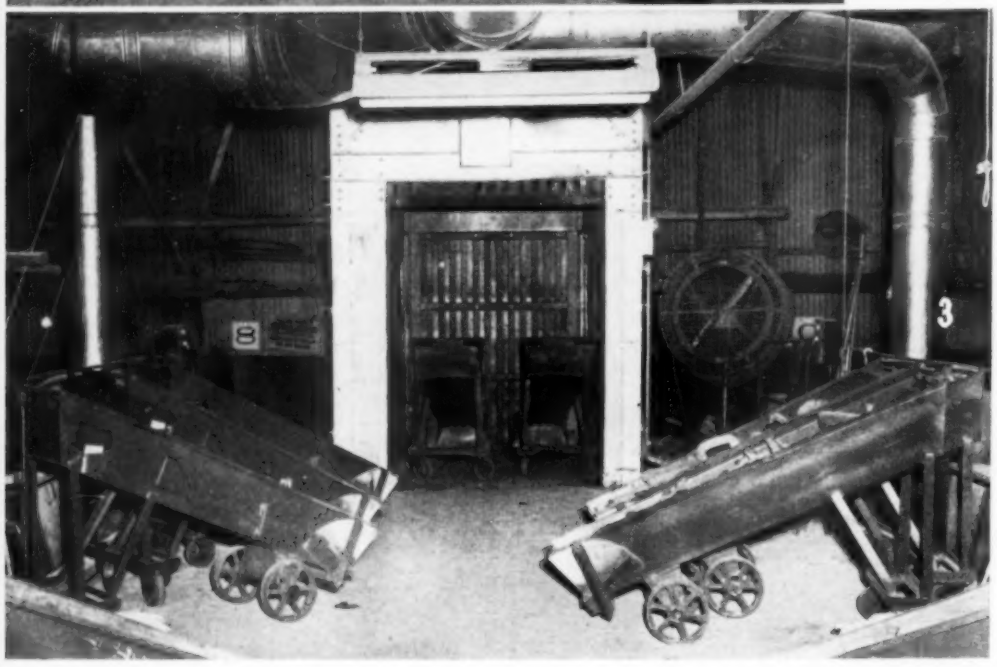
BRANCH OFFICES *with* FIELD ENGINEERS *in* PRINCIPAL CITIES

CLEVELAND 5, OHIO





AN EFFICIENT A
Bronze



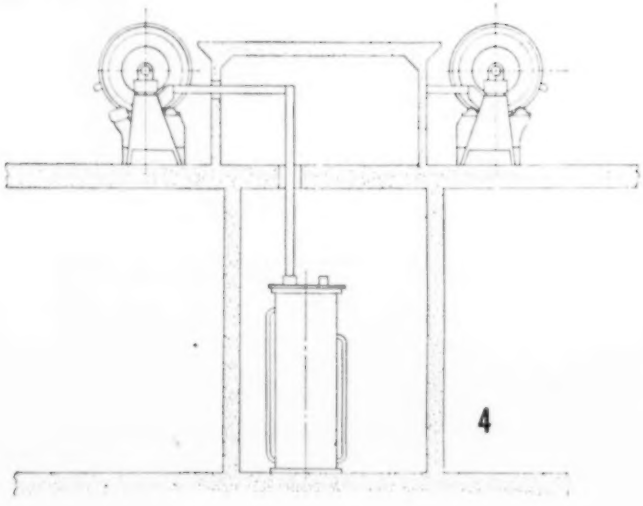


Fig. 2—Tapping a heat of lead bronze from a 200-lb capacity electric furnace equipped with base mounted electrode brackets and flexible copper strap leading to overhead bus bar

Fig. 3—Charging trucks, 750 lb capacity, are lifted by elevator from metal room on first floor to this second-floor charging platform.

Fig. 4—Sketch of furnace installation in Fig. 1 showing location of transformers

WHILE the foundry industry has become aware of the need for using modern equipment in the most efficient manner and under the best possible working conditions, modernization of the melting room in many brass or bronze foundries has not matched the progress in some other departments. At the same time, furnace manufacturers are striving to lower heat losses to the melting room and ventilation engineers are devising methods for improving atmospheric conditions. The combination of latest equipment design and most efficiently engineered layout will help the foundryman not only to lower his overall melting room costs but also to provide working conditions more attractive to present and prospective employees.

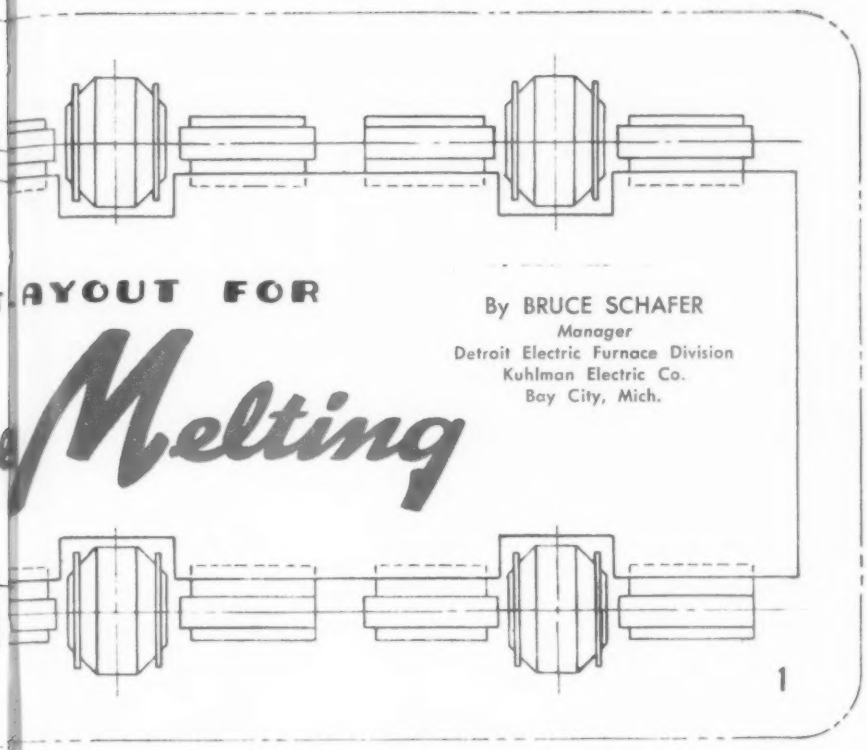
While the melting room must also handle the raw materials and deliver hot metal to the pouring floor, its prime function is to convert solid copper alloys to the molten state. No matter what type of melting equipment is used, the unit or units must be selected with care and planning. The major requirements may be grouped as follows:

1. Molten metal required per hour and the daily total for each alloy.

2. Composition of each alloy to determine which alloys may be melted in the same furnace.

3. Optimum ladle size as determined by ladle capacity versus pouring time and allowable temperature drop while pouring.

4. Fluctuations of production re-



LAYOUT FOR Melting

By BRUCE SCHAFER
Manager
Detroit Electric Furnace Division
Kuhlman Electric Co.
Bay City, Mich.

Fig. 1—Showing arrangement of six indirect arc electric furnaces, each 750-lb capacity, installed on the second floor of a large bronze foundry

quirements, daily and yearly.

5. Melting rate of furnace.

As an example of furnace size selection, consider a production foundry requiring 10,000 lb of bronze per 8-hour day. Three alloys—85-5-5-5, Navy M and Navy G—are melted in almost equal amounts and can be melted in the same furnace. It is naturally desirable to keep all these alloys coming to the pouring floor in a steady flow. This virtually eliminates the use of a single large furnace. The use of a battery of smaller furnaces, in addition to providing a steadier flow of metal, will also enable the foreman to shut one or two furnaces down completely during slack periods, and still maintain efficiency on the units still in operation.

The selection of the proper size smaller furnaces can be determined as follows (indirect arc electric furnaces used as examples):

Nominal heat size	400	500	750
Furnace capacity per hour	750	850	1000
Number of furnaces	3	3	2
Hours per day to melt capacity	8	7	9

If the requirements of mold size, pouring time and temperature drop dictate the use of 250-lb ladles, the use of 400-lb heats is automatically eliminated. If 500-lb heats are melted, with three furnaces two ladle gangs will empty one furnace and be ready for the next furnace well within the 11-12 minutes spacing between heats. With 750-lb heats, three ladle gangs will be needed to empty the furnace promptly and will have approximately 22½ minutes between heats.

The advantages of using either the 500-lb or the 750-lb furnaces are as follows: Three 500-lb furnaces require one less pouring gang; provide one furnace for each alloy; furnish a greater number of heats, thus a more even flow of metal to the pouring floor; offer greater flexibility and a shorter working day. The two 750-lb furnaces have the advantages of lower initial cost and less space requirements, while the two sizes have equal advantages from the standpoints of furnace operating labor required, power consumption and refractory costs. From this it will be seen that greater efficiency in furnace operation will result from the use of three furnaces melting 500-lb heats.

As the next step in laying out an efficient melting room we must now consider the physical layout of the melting room. The end result should bring about:

1. Material flow with minimum labor, minimum control and minimum supervision.

2. Furnace operation with the same points, plus maximum furnace efficiency.

While no set rules can be made for such layouts, the following points must be considered in their proper relation to overall efficiency of operation.

1. Most desirable method of handling ingot from railroad or truck to storage and to charging area.

2. Handling and return of remelt to charging area.

3. Making up, weighing and transport of charges to furnace.

4. Filling ladles from furnace and movement to pouring floor.

5. Location of control equipment and auxiliary motors, blowers, transformers, etc.

6. Record keeping and control of operations.

The consideration of these points may best be brought out by consideration of two examples of melting room now in operation.

As the first example, let us consider a large bronze foundry melting 85-5-5-5, Navy M and Navy G plus a small amount of special alloys. Following the steps outlined for furnace size selection, the use of six 750-lb indirect arc electric furnaces was prescribed. By temporarily moving some small oil-fired furnaces, sufficient space was made available on the second floor for the new installation without retarding production. Directly below this second floor area was space for the transformers. All cleaning operations were located on the ground floor and incoming ingot was received on the ground floor. The furnaces were located on the second floor on each side of a rectangular platform from which charging was done, and the transformers were directly below the furnaces to obtain the shortest possible bus bar run. See Figs. 1 and 4.

Operate Furnaces on Second Floor

Charges of ingot, remelt, borings and alloys are made up and weighed in an inclined box truck on the ground floor. The trucks are then lifted to the elevated charging platform by platform elevator. Sufficient space is available on the platform for storage of trucks containing the different alloys. The charger, working on the platform, easily charges all six furnaces. See Fig. 3.

Each of the furnaces is equipped with automatic controls to enable one furnace operator to melt and tap three furnaces. Ladles are brought to the furnace by a monorail which encircles the platform and switches to the pouring floor. The use of the complete loop eliminates tie-up on the monorail and enables three ladle gangs to completely empty the furnace in 1½ to 2 minutes.

(*Continued on page* 216)

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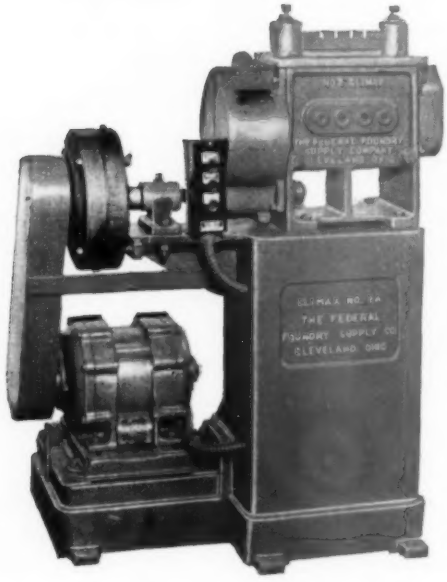

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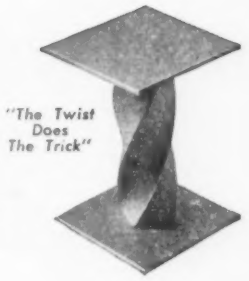

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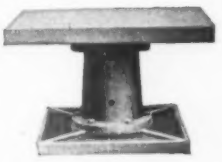

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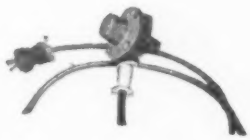

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THE OHIO ELECTRIC MFG. CO.

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(*Continued from page* 213)

In this example, the following labor force is necessary to maintain an 8-hour output of 42,000 lb: Two charge weighers, one furnace charger, two furnace operators, one melting supervisor and three ladle gangs. Put another way, the amount of metal handled is 580 lb per man-hour.

For the second example we have a foundry desiring to produce approximately 10,000 lb of brass and bronze per day, divided as follows: 3500-6000 lb of tin bronze alloys, 3000-4000 lb of leaded bearing bronze including 1000 lb of 80-10-10, and 0-3500 lb of aluminum bronze. Obviously it would be ill-advised to try to melt these alloys in one furnace because of contamination. The pouring floor requirements can be met with 200-lb heats.

Use Three Furnaces

A 200-lb, 100-kw indirect arc furnace will melt up to 3000 lb of any of these alloys per 8-hour day with an average melting cycle of 25 minutes for a 225-lb heat. It was logical to use three such furnaces and operate as follows:

First day melt 6000 lb tin bronze and 4000 lb leaded bronze. Use furnace No. 1 for tin bronze and furnace No. 2 for Navy M, G, and 80-10-10. Use furnace No. 3 on other leaded bronze.

Second day melt 3500 lb tin bronze, 4000 lb leaded bronze and 3500 lb aluminum bronze. Use furnace No. 1 on tin bronze, furnace No. 2 on leaded bronze, and furnace No. 3 on aluminum bronze.

By using 250-lb ladles, one man can tap all heats and has an average of 8 minutes to pour off each ladle and return for the next heat. One furnace operator can handle all three furnaces with a helper to weigh and help place the charges in the furnaces.

The furnaces were located in the old melting room, which is separated from the pouring floor by electronically-operated swinging doors. This separation was necessary to reduce the lead fumes in the pouring floor. Reduction of lead fumes in the melting room was accomplished by individual hoods for each furnace. Less danger to the furnace operators from lead poisoning was also accomplished by these hoods as it was not necessary to stand over the open melting chamber to charge the melting units.

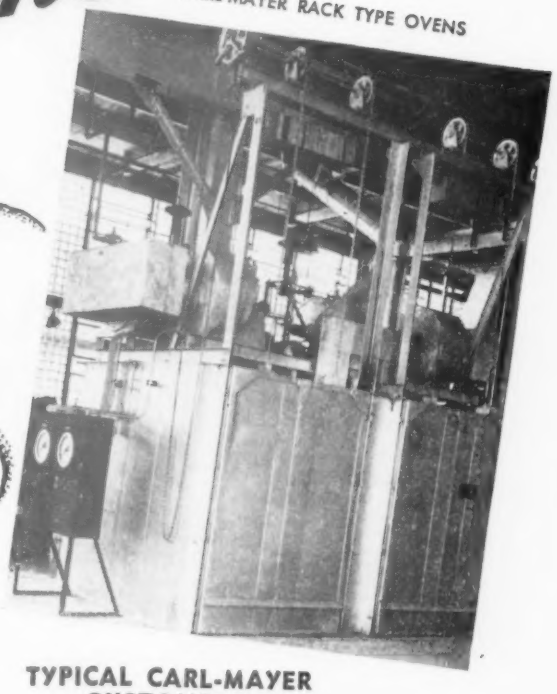
The indirect arc furnace and the transformers were located for minimum operator travel and easy accessibility to the controls and short-

(*Concluded on page* 218)

Carl-Mayer Ovens

SELECTED FOR NEW FOUNDRY

CARL-MAYER RACK TYPE OVENS



It is logical that the new foundry of American Brake Shoe Co. should call for the most modern, efficient and economical operating equipment. Such equipment is not chosen without careful study and comparison by foundry engineers.

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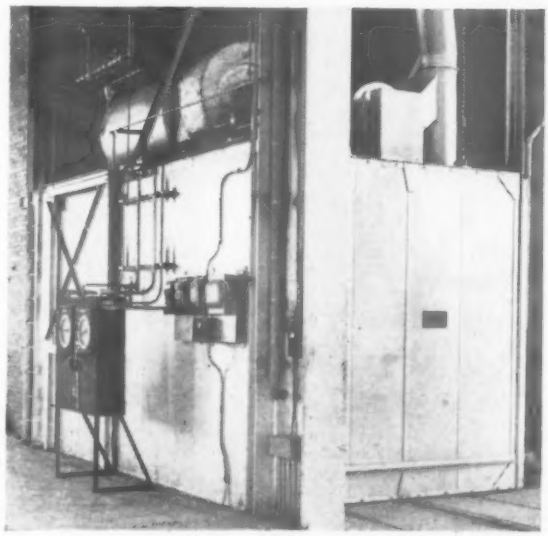

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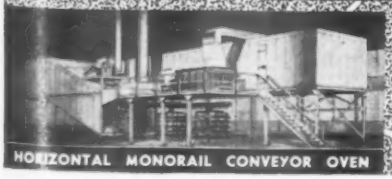

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(*Concluded from page* 216)

est power circuits. The possibility of future expansion to six furnaces was also taken into account in making the layout.

The furnaces are charged and tapped from the front of the unit without difficulty as they are low and easily accessible. Charges are brought to the furnace on wheeled carts. Ladles are carried by monorail to a ladle buggy (Fig. 2) used to tap the heat.

As there is but one operator and one ladle gang, it is almost impossible to have heats waiting for molds nor do the molders have to wait for metal.

To complete the picture, a supervisor watches the foundry production and checks the metal temperature. A total of three men prepare molten metal for the foundry and have an average hourly output of 417 lb per man.

From these two examples, it is evident that the selection and location of melting units must depend upon the conditions prevailing in the individual foundry. The melting units must fit the job to give efficient, economical performance under these conditions. In addition, they must be located for least manpower, least worker fatigue, and contribute to better, cleaner working conditions. If these aims can be accomplished, the foundry will be more attractive to intelligent workmen and a more profitable type of operation.

Instrument Training Courses Planned

The Foxboro Co., Foxboro, Mass., has announced that it will conduct courses of two-weeks' duration, during August, October, November and December, in the theory, application, operation and maintenance of industrial instruments. The courses provide an opportunity for intensive training by specialists in instrument engineering and in its many fields of application. Enrollment is by application, forms for which are available through all branch offices or at the home office in Foxboro, Mass. Special courses will also be arranged for specific industry groups, or for companies wishing to send a group sufficiently large to warrant a special class for study of particular instruments and applications.

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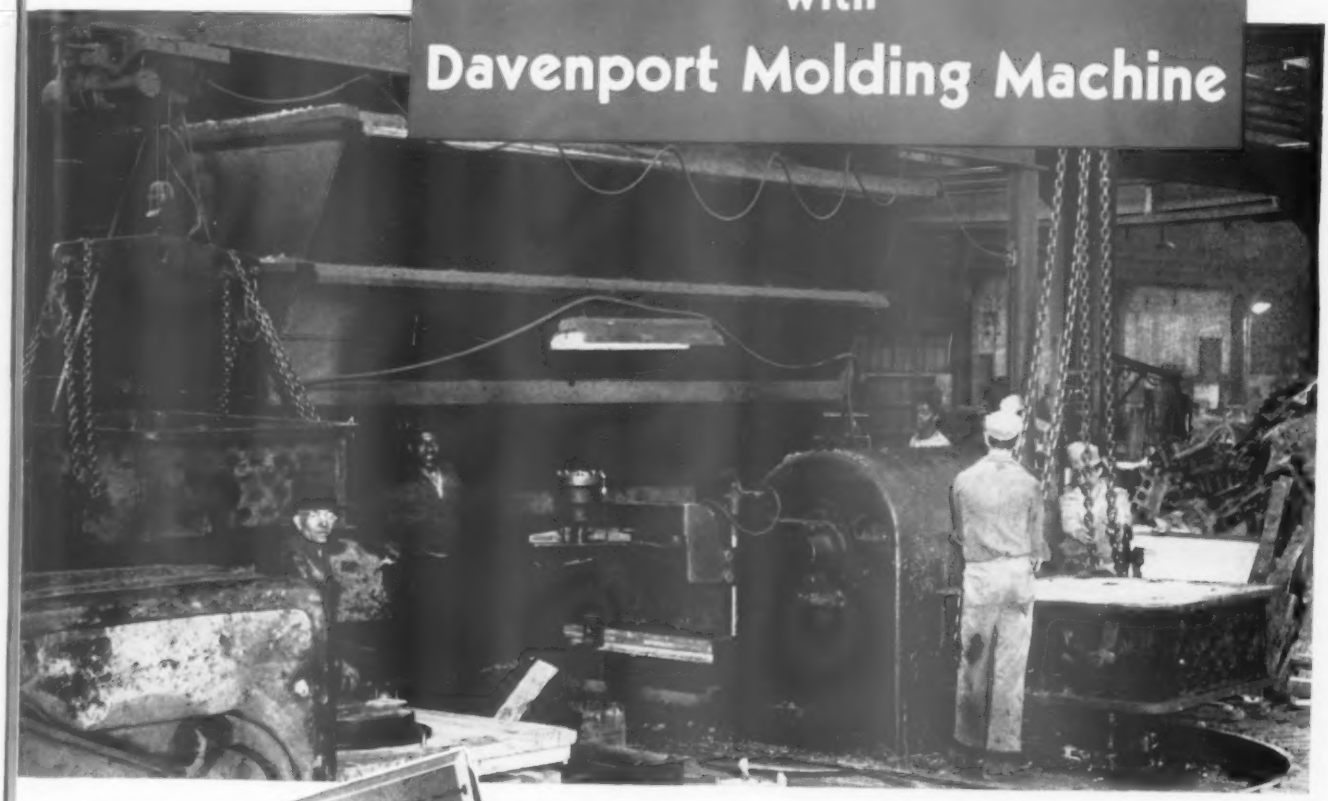

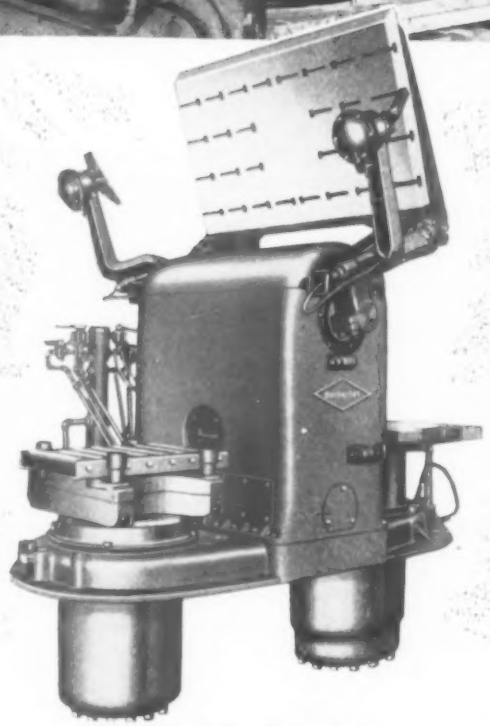

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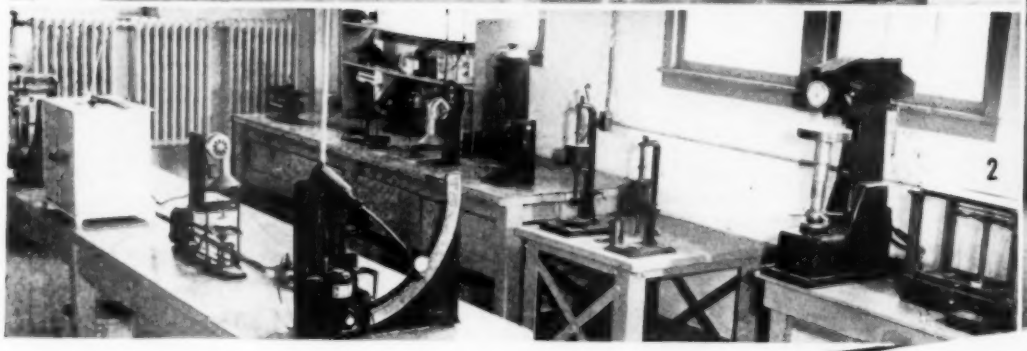
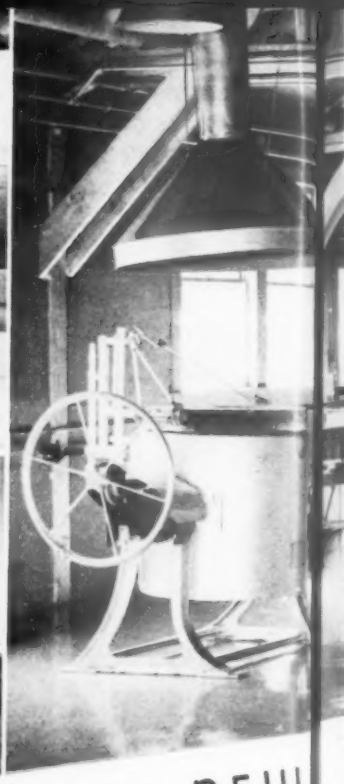




WISCONSIN OPERATING NEW Metal Casting

THE Department of Mining and Metallurgy of the Engineering College of the University of Wisconsin recently invited men of the foundry industry to inspect its new Metal Casting Laboratory. An open house was held at the university in Madison, Wis., to call attention to the new foundry and to the school's broadened program in foundry instruction, and about 300 visitors passed through the laboratory during the day and evening. Faculty and engineering students were available to answer questions, act as guides and demonstrate the use of various pieces of equipment.

The Metal Casting Laboratory was established and equipped for the purpose of providing fundamental instruction in the engineering and science involved in foundry practices. The selection of foundry equipment, materials and plant layout was approached with the intention of teaching metal casting as a basic engineering process for putting metals into useful shapes. Instruction with this viewpoint may be given more effectively when the academic course in foundry and related subjects is well correlated with the plant facilities of the laboratory. Through the work in the laboratory the student should be enabled to see the scientific and engineering fundamentals operative in the materials and processes employed in the industry.

The laboratory occupies a separate single-story building having 6460 sq ft of floor area. The U-shaped structure houses the laboratory, a classroom and office. Work areas in the foundry have been segregated to point out some of the typical departmental subdivisions of a foundry's operations. Definite space has been allocated to each of the following activities: Molding, coremaking, sand conditioning, melting and pouring, sand laboratory, cleaning and inspection, pattern storage, general storage of materials and tools, metallurgical laboratory (available in adjacent metallurgy departmental building).

The general molding area, as shown in Fig. 3, provides space for both bench and machine molding. Molding machines available for student use consist of a squeezer, a jolt-squeezer and a cope and drag pair of the jolt-squeeze pin lift stripper and jolt-squeeze rockover types. While machine molding is emphasized, sufficient instruction in hand molding is provided so that the students may realize the "feel" and importance of proper molding sand conditions. Floor molding instruction is given on a demonstration basis.

Coremaking is carried on in the area shown in Fig. 1. Materials are stored in labeled containers where they may be readily observed. The student thus has a better opportunity for learning the names and appearance of the many materials used in the foundry. This idea has been carried out wherever possible with other materials. Cores now are made by hand but plans call for installation of a small commercial core blower. Not shown in Fig. 1 is an electric core baking oven.

Sand is conditioned in an area located between the molding and coremaking departments. A muller, screenerator, and portable mixer currently are used for this purpose. Mainly ferrous and nonferrous natural molding sands are used but synthetic sands are mixed for instructional purposes. Sands are bin-stored when not in use, to keep them from being contaminated. Convenient to the sand conditioning area is the sand testing laboratory shown in Fig. 2. This laboratory has been equipped for both the routine control tests used in con-

(*Continued on page* 222)

...g Laboratory

By RICHARD W. HEINE

Department of Mining and Metallurgy
University of Wisconsin
Madison, Wis.

Fig. 1—Coremaking area at the new laboratory of the University of Wisconsin

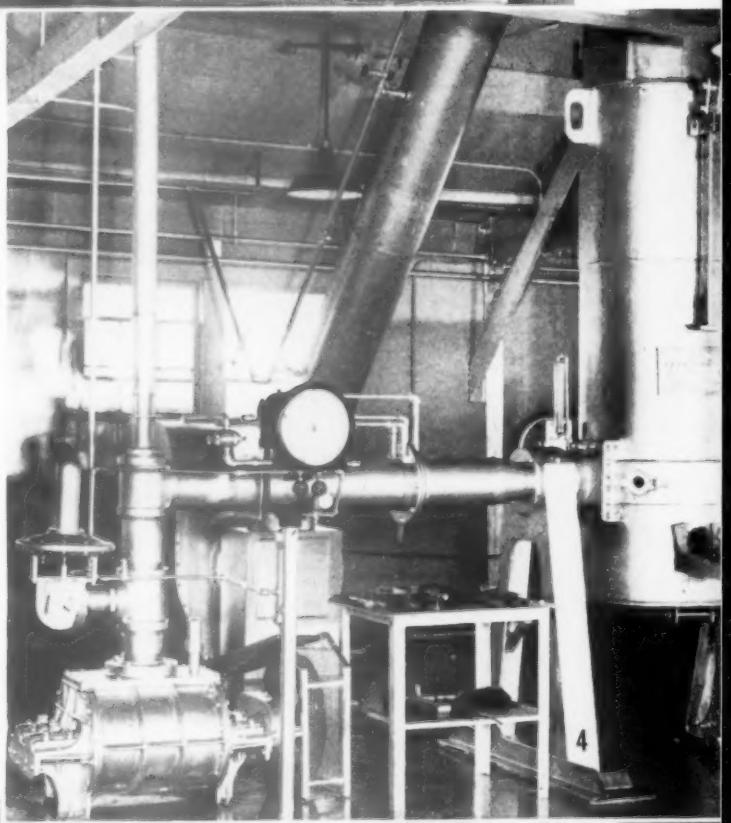
Fig. 2—Sand testing laboratory is well equipped

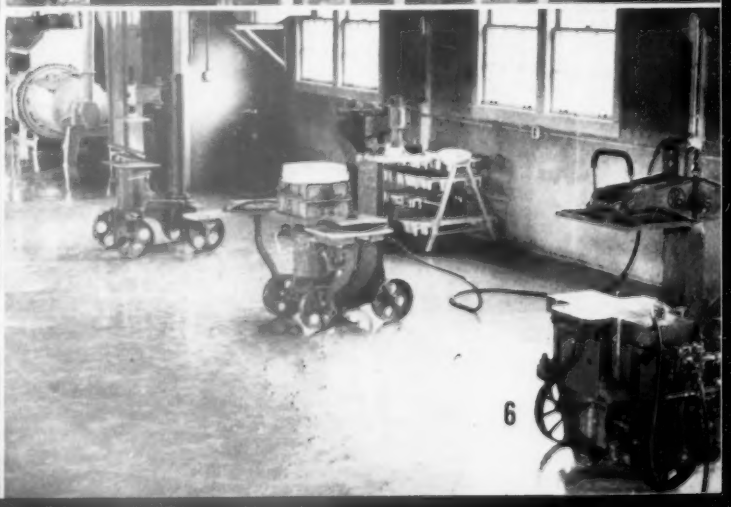
Fig. 3—Both bench and machine molding are carried on in this area. Good housekeeping is stressed

Fig. 4—Cupola furnace is equipped with air-weight controller and positive-displacement blower

Fig. 5—Equipment provided for cleaning castings

Fig. 6—Units available for machine molding





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REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

(*Continued from page* 220)

junction with the foundry operations and the investigations of those especially interested in sand research work.

Floor space set aside for melting operations was planned for the installation of a number 0 cupola, a tilting pot furnace, a 250-lb direct-arc steel melting furnace, and induction melting furnaces. The latter two units are on hand but have not been installed. A view of the cupola is given in Fig. 4, which also shows the air-weight controller and positive-displacement blower. The cupola is lined to 18 in. ID and its operation throughout has proved favorable for instructional purposes. To illustrate its place in laboratory instruction a recent run may be cited. Starting with lighting of the bed and finishing with a dropped bottom, a complete run melting 600 lb of metal was made in two hours, and this period included preparation of molds by the class. Since the laboratory class period lasts only two hours, this schedule is practicable.

Cool Cupola Gas

An unusual feature of the cupola installation is the method of handling cupola gases. The stack is equipped with a down-comer connected to an exhaust fan. Gases are cooled by a water spray in the down-comer and exhausted through the side of the building at window level. A trap separates solid particles from the gases. By this means, clean and inoffensive gases are passed to the atmosphere.

The cleaning area is shown in Fig. 5. A blast cabinet, a tumbling mill, and an airless blast table have proved very serviceable for cleaning the castings produced by students. There are the usual hand tools and grinding equipment together with an adequate exhaust-type ventilating system.

Complete metallurgical laboratory facilities are readily accessible in the adjacent building of the Department of Mining and Metallurgy, although the foundry itself has some testing machines in the sand laboratory. Equipment for physical testing, metallographic examination and chemical analysis may be used as desired in the course work. For casting inspection, a 120-kv radiographic machine is available. X-ray diffraction and spectrographic equipment may be operated by qualified students.

The available facilities permit an excellent job of teaching under university conditions. Of course they

(*Continued on page* 224)

Moistmeter

Fast • Portable • Accurate—Electric Moisture Tester FOR THE FOUNDRY

The Moistmeter is a versatile instrument that determines instantly the exact moisture percentage of either core or molding sand, on the floor or in the sand system.

It is ruggedly constructed, simple to operate and easy to carry around. Moisture readings can be taken at selected depths, from either a pint can or a large bin in just three seconds.

When you equip each sand preparation crew with the Moistmeter, you can control the moisture range within exactly specified limits with considerable improvement in your castings.

Moistmeter testing moisture of sand on the foundry floor.

Moistmeter being used to test a sand sample from the mixer

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(*Continued from page* 222)

are not complete nor fulfilled. In fact, the present building was an empty shell at the beginning of the school semester in February. The installation has been accomplished entirely since that time and naturally must require constant additions, improvements and refinements to remain of top caliber. Future plans call for equipment and installations which will expand the instruction offered in die and permanent mold casting, precision casting and centrifugal casting under a variety of conditions.

Considerable effort was expended to make the new foundry clean and attractive. One motive is the hope of developing and extending habits of cleanliness and good housekeeping into the workmanship of the students, particularly those in young and formative years. An attempt was made to keynote orderliness in doing with orderliness and accuracy in thinking. Painted floors and equipment serve to emphasize this point, and the results have proved it desirable.

Elimination of the sand heap and debris around the cupola have helped considerably. The cupola bottom is dropped into a gondola that is immediately carted outdoors and wet down. A portable pouring platform was devised to keep metal drippings from the floor. Vacuum cleaning of dust has been instituted. Specific storage places for all materials and tools promote a good appearance and increase the students' efficiency. The cleanliness evidenced by the photographs is striven for by a clean-up period at the end of each laboratory class. Such a condition is contrary to what the student normally expects from the "foundry" course. After a semester of operation under these conditions the result has been a definite quickening of student interest and the development of a high morale of workmanship. In other words, they like it.

Laboratory Serves Two Groups

Existence of the available facilities is rendered worthwhile by the service it may offer to men. Its primary objective is to provide a means of sound foundry instruction. In this connection the laboratory serves two main groups. These are the mechanical and metallurgical engineering students. All mechanical engineering students are required to take the foundry course offered by the Department of Mining and Metallurgy. This course is concerned mainly with operating and engineering phases of the industry. Another course for the metallurgical students more particularly stresses the technical and metallurgical phenomena. The initial courses may be followed by work of a more advanced nature if desired. Students in other branches of engineering may elect any of the courses to suit their purposes, and it is common to have chemical, electrical, civil, and agricultural engineering students in the classes.

Most of the students make their first contact with the foundry industry in these courses, and for many it is their last and only contact. For these men the metal casting laboratory gives an insight into the foundry industry and its role in their future work in other engineering fields. For other students who become more directly concerned with the foundry, the laboratory and course work first causes them to become aware of the opportunities which the metal casting industry may offer. Students who are thinking of graduation and permanent employment are particularly interested to learn of Wisconsin's place among the ten leading foundry states in the United States.

(*Concluded on page* 226)

Getting a LIFT with a Stearns MAGNET

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(*Concluded from page* 224)

the close proximity of five other of the ten, and the significance of the industry in the national economy. With these factors as a background and as one of the authorized Foundry Educational Foundation universities, Wisconsin occupies a very favorable position for introducing young engineers to careers in the foundry industry.

In addition to the teaching purposes of the laboratory, it serves as a workshop for the research of faculty and students. The variety of equipment available is especially suitable to investigations in foundry materials and processes and the metallurgy metals.

Such work will be encouraged by the recently reactivated University of Wisconsin Engineering Experiment Station.

Needless to say much planning and work have gone into the development of the laboratory and program. The project has gone forward under the direction of Prof. G. J. Barker, chairman of the Department of Mining and Metallurgy, and Prof. P. C. Rosenthal of the same department of the university. Dean M. O. Withey of the Engineering College has provided the administrative encouragement so essential to the program.

Proper acknowledgement is due the men of the foundry industry, the AFS, the Foundry Educational Foundation, and the Wisconsin Chapter of the AFS for their assistance and encouragement in the effort.

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"FOR THAT EXTRA SERVICE"
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ALUMINUM ALLOY CASTINGS

(*Continued from page* 97)

nent mold castings. At times even as little as four hours or less are sufficient in some cases.

Solution treatment increases both the strength and ductility of the alloy. In fact, immediately after such treatment the alloy is usually in its most ductile condition. As the supersaturated condition brought about by solution treatment is an unstable one, alloys given this treatment tend to change toward a more stable state. This change involves the precipitation of alloying constituents out of solid solution. Hardness and strength increase and ductility decreases as this aging process proceeds. Aging takes place to a limited extent at room temperature over a comparatively long period of time. The process can be intensified and accelerated by raising the temperature, as discussed in succeeding paragraphs.

Artificial Aging—A variety of effects can be obtained by artificial aging, ranging from simple annealing through age hardening both in the as-cast condition and after solution heat treatment, to the so-called overaged or stabilized condition. Annealing, which consists of heating for relatively short periods at temperatures of 600 to 700° F, is done mostly to provide maximum softness and maximum dimensional stability. It affects mechanical properties but little, although in some alloys tensile strength is decreased slightly and elongations increased slightly. As might be expected, annealing finds limited commercial application.

Artificial aging for longer periods of time, called age hardening or precipitation treatments, produces controlled precipitation of alloying constituents from solid solution. These treatments may be applied to castings in the as-cast condition or following solution heat treatment and quenching.

Artificial aging treatments are applied to castings in the as-cast con-

(*Continued on page* 228)

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Many Special Designs
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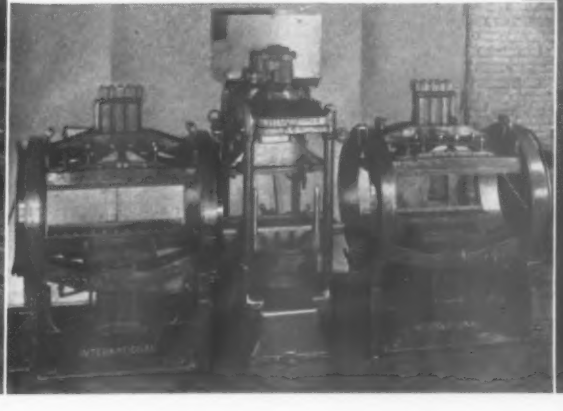

(*Continued from page* 226)

dition when the higher mechanical properties obtainable with a solution treatment, or a solution treatment followed by artificial aging treatment, are not required. Such treatments at moderate temperatures effect some increase in hardness or tensile strength with a sacrifice in ductility. At higher temperatures, the growth that normally takes place in most alloys while in use at elevated temperatures may all be consummated during precipitation treatment, with resulting improved dimensional stability in castings that are so treated.

Artificial aging treatments of solution treated castings at moderate temperatures (less than about 375° F) increase tensile and yield strength and hardness still more, but at the sacrifice of some of the ductility. By varying time and temperature, desirable combinations of these properties can be obtained.

As the precipitation process proceeds, the hardness and tensile properties reach a maximum after which further treatment results in some reduction in these properties but in an improvement in elongation. Overaging, or stabilizing treatment, carries these properties beyond this maximum. Like aging of as-cast castings at the higher temperatures, overaging treatment after solution treatment allows the growth process to take place during the heat treatment. Consequently, castings treated in this manner are substantially free from future growth at elevated temperatures. Solution heat treatment followed by overaging thus is particularly useful for castings that must have high mechanical strength plus dimensional stability at temperatures below about 400° F, such as parts of internal combustion engines.

Some castings, especially those produced in permanent molds and those composed mostly of thin sections, retain enough of the alloying constituents in solid solution in the as-cast condition so that solution heat treatment is not necessary. In these cases, only aging is required to develop the desired mechanical properties. Others, notably alloy ZG41, age at room temperature sufficiently to develop their maximum mechanical properties within a few weeks.

Recommended heat treatment times and temperatures for common commercial aluminum alloys are given in Table I. In the "Aging" columns, the higher temperature, longer time treatments produce the overage, or stabilized, condition.

Heat Treating Equipment—In selecting furnaces for heat treating aluminum alloys four factors should be considered: (1) uniformity of temperature throughout the interior; (2) flexibility of operation; (3) freedom from harmful reactions between furnace atmosphere and the castings being treated; and (4) cost.[5] In spite of its higher cost, electricity often is used as the heating medium. Resistance type furnaces with nickel-chromium heating elements commonly are used; these units are satisfactory for operation at temperatures up to 1900°F, which is well above the temperatures required for heat treating aluminum. For best results low energy input per unit of heating element area should be used.

Gas and oil fired furnaces also are commonly used, especially the indirect or radiant-tube type. Direct-heated fuel-fired furnaces in which the combustion gases are circulated through the interior may be used provided the furnace atmosphere contains a sufficiently high concentration of carbon dioxide and is free from sulphur and excessive moisture.

(*Continued on page* 230)

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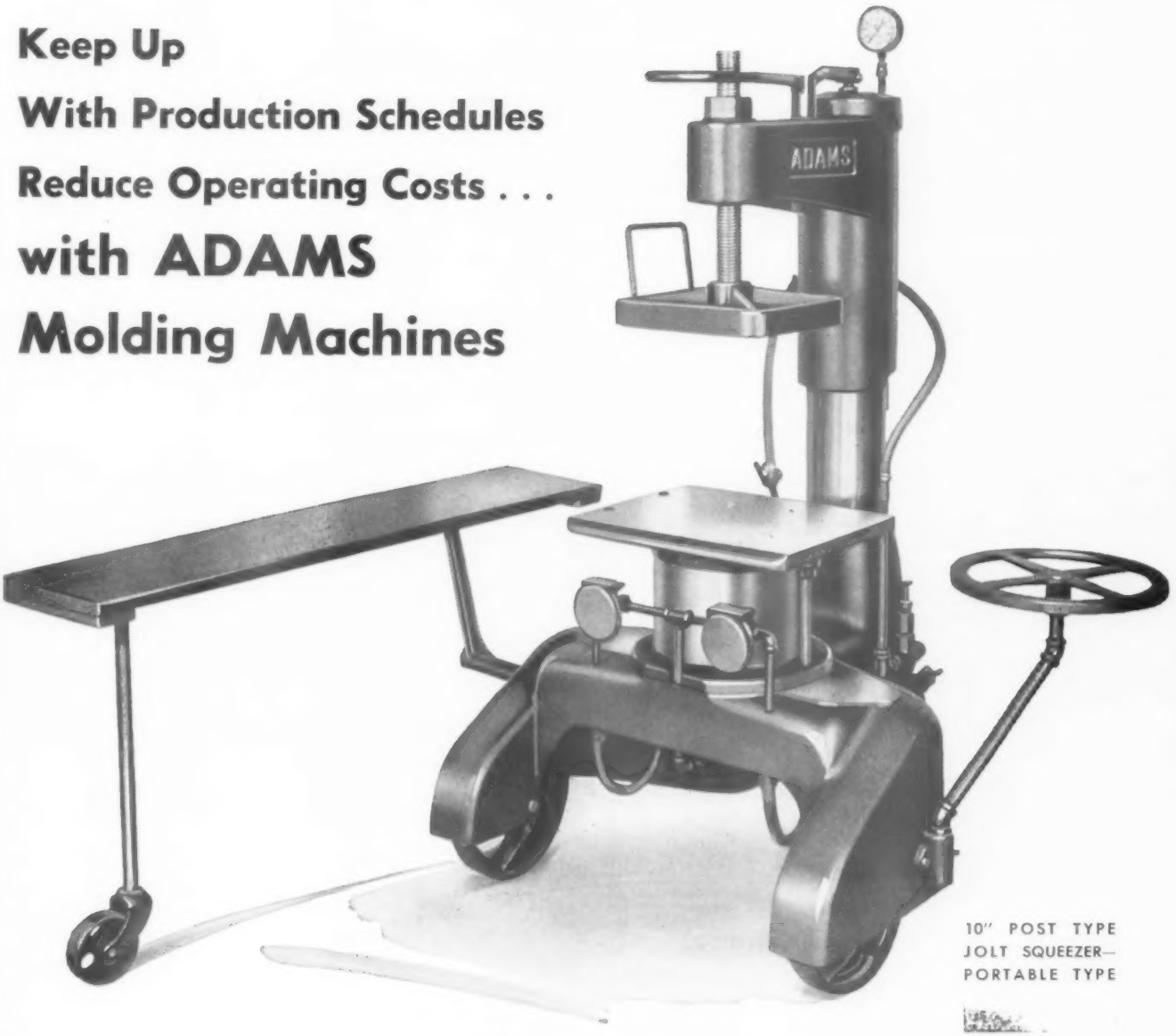

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MOLDING MACHINES and FLASK EQUIPMENT

(*Continued from page* 228)

Although salt-bath furnaces are used to some extent for heat treating wrought aluminum alloys, they should not be used for aluminum castings. Furnaces should be designed so as to provide for a uniform temperature throughout the working zone within plus or minus 5°F. Mechanical circulation is essential to accomplish this, and baffles usually are required to prevent air from being drawn directly from the heating units onto the castings being treated in this type furnace.

The capacities of commercial heat treating furnaces vary over a wide range, from about 100 pounds of castings per charge for small foundries to more than 20,000 pounds per charge for large operations. Pit type furnaces are usually used for small operations, while car type and continuous furnaces are preferred for large production runs of small and medium size castings, offering advantages of greater uniformity of temperature and more definite and shorter intervals before quenching, with consequent greater uniformity in the finished product and freedom from occasional bad heats.

To maintain the close regulation of temperature required for the development of the desired properties, heat treating furnaces must be equipped with automatic pyrometric control. Temperature recorders also should be provided, as a complete time-temperature record assists operations materially. Combination recorder-controller units are convenient for this purpose. To protect against failure of the control equipment and consequent possible overheating, a separate automatic limit control is desirable which can be set at a temperature slightly higher than operating temperature. All temperature measuring and controlling equipment should be checked against reliable standards at appropriate intervals.

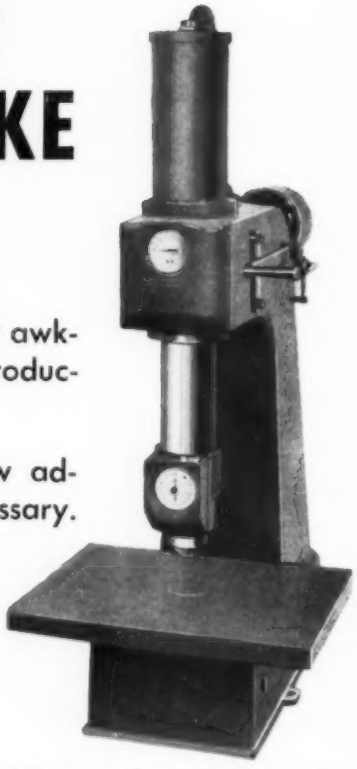
Before putting a new furnace into regular operation a temperature survey should be made to determine whether the required uniformity of temperature within plus or minus 5° F is attained under operating conditions. This should be done with a full charge of castings in the furnace and with several thermocouples appropriately spaced throughout the interior.

Heat Treating Procedure—For convenience in handling in pit and car type furnaces, castings may be stacked in steel wire baskets which are charged directly into the furnace. These racks or baskets must be so designed, and the castings so stacked, as to permit free circulation of air and of the quenching medium to all parts of the castings. In solution treatment, care must be exercised to stack the castings in such manner as to avoid imposing stresses on the castings, as their mechanical strength is low at solution treatment temperature. Intricate castings may need to be supported on special fixtures to avoid distortion during solution treatment. Temperatures for solution treatment should be as high as possible in order to obtain the desired results within specified times (Table I). Care must be exercised, however, that the temperature at any point is not high enough at any time to melt any of the alloy constituents.

Castings of different alloys that are heat-treatable at the same temperature may be treated at the same time. In solution treatment, the entire charge may be left in the furnace with the alloy requiring the longest treatment, as the added treatment time for the other alloys will cause no harm. In aging treat-

(*Concluded on page* 232)

A BETTER LONG STROKE BRINELL



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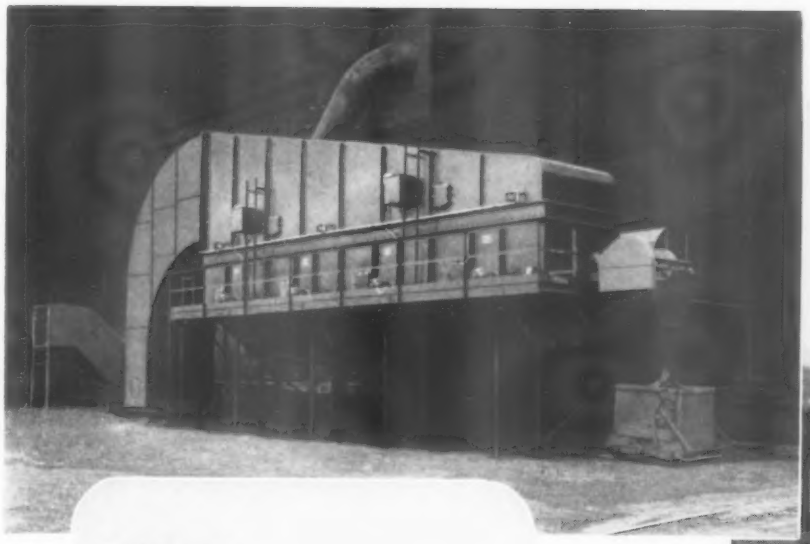

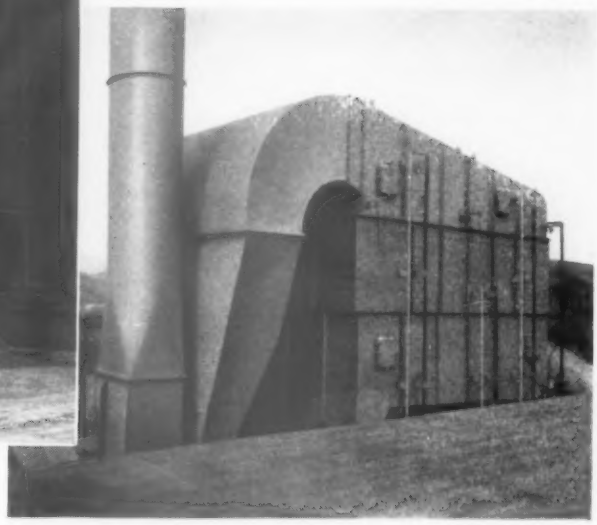

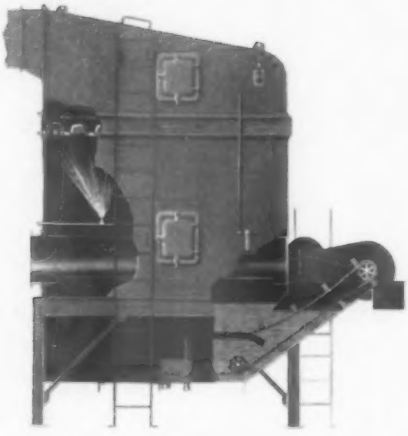

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(*Concluded from page 230*)

ments, provisions must be made for removing castings at the end of their specified treatment times to avoid overaging.

Furnaces may be charged when either cold or hot. Time allowances must be made for the charge to reach treatment temperature, the treatment timing beginning when this temperature has been reached. These allowances can best be determined by experimental means for different classes of castings and different loadings.

Table I specifies a time range for aging treatments. For any given casting the exact time required for the desired properties depends on casting and foundry variables. In determining the correct time for any specific casting the hardness required may be used as a gage. After aging is completed, the castings are removed and allowed to cool naturally to room temperature.

Undertreated material may be given additional treatment to bring out the desired characteristics. Overtreated material in the aging treatment may be given an additional solution treatment and reaged. Castings overheated in solution treatment, however, must be scrapped.

A rapid quenching from solution treatment temperature is necessary for optimum mechanical characteristics. The time between removal of the charge and complete immersion in the quenching medium must be as short as possible, and intervals of less than one minute are realized commercially. Temperature of the quenching medium is not critical, but when water is used boiling temperature is recommended in order to minimize quenching stresses and distortion. Warped castings should be straightened immediately following solution treatment before any aging has taken place, as the metal is in its most ductile state at that time.

Conclusion—As this discussion has indicated, choice of the best heat treatment for a given alloy for a particular application is not too simple, and close co-operation between the designer, metallurgist, foundryman and user is necessary to assure the best commercial heat treatment possible for a given casting. Good equipment is an important factor in obtaining optimum properties in heat treated castings, especially accurate temperature-control devices.

Previous articles in this series have discussed the aluminum alloys commercially available, melting and pouring procedures, casting design, sand molding, and permanent mold practices. Future articles will cover inspection and quality control, and trimming and finishing.

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5. *Practical Metallurgy*, George Sachs and K. R. Van Horn, American Society for Metals, 1940.

PRIZE-WINNING APPRENTICES: Caterpillar Tractor Co.'s two first-place winners in the 1948 AFA national apprentice contest are shown in front of a wall plaque which lists names of that company's apprentices who have won a total of ten prizes since 1935 in the annual contest. Left to right: Frank W. Shipley, Caterpillar foundry manager; John D. Morehead, gray iron molding winner; Dwight L. French, patternmaking winner

Management Groups Are Formed

Gray iron management executives representing foundries in the Buffalo, Cincinnati and northeastern Pennsylvania area recently established management groups of Gray Iron Founders' Society Inc.

In Buffalo the group officers are: John H. Pohlman, Pohlman Foundry Co. Inc., Buffalo, chairman; E. B. Tuohey, Niagara Foundry Co., Niagara Falls, N. Y., vice chairman, and Charles F. Bastien, Lake Erie Foundry Co., Buffalo, secretary-treasurer.

The Cincinnati group, covering foundries in southern Ohio and parts of Indiana, Kentucky and West Virginia, elected Raymond J. Redmond, Buckeye Foundry Co., Cincinnati, chairman; William Beiser, Reliance Foundry Co., Cincinnati, vice chairman, and Frank E. Hutchinson, Reliance Foundry Co., secretary-treasurer.

Northeastern Pennsylvania, centering on Scranton and Wilkes-Barre, Pa., elected Kenneth F. Mills, J. W. Pinnell Foundry, Scranton, chairman; E. Kime, Hallstead Iron Foundry, Hallstead, Pa., vice chairman, and Edward Stuckie, J. Frank Seely & Son, Clarks Summit, Pa., secretary-treasurer.

R. L. Collier, executive vice president of the society, addressed each of the groups on the society's activities and plans, and discussed current developments in the foundry industry.

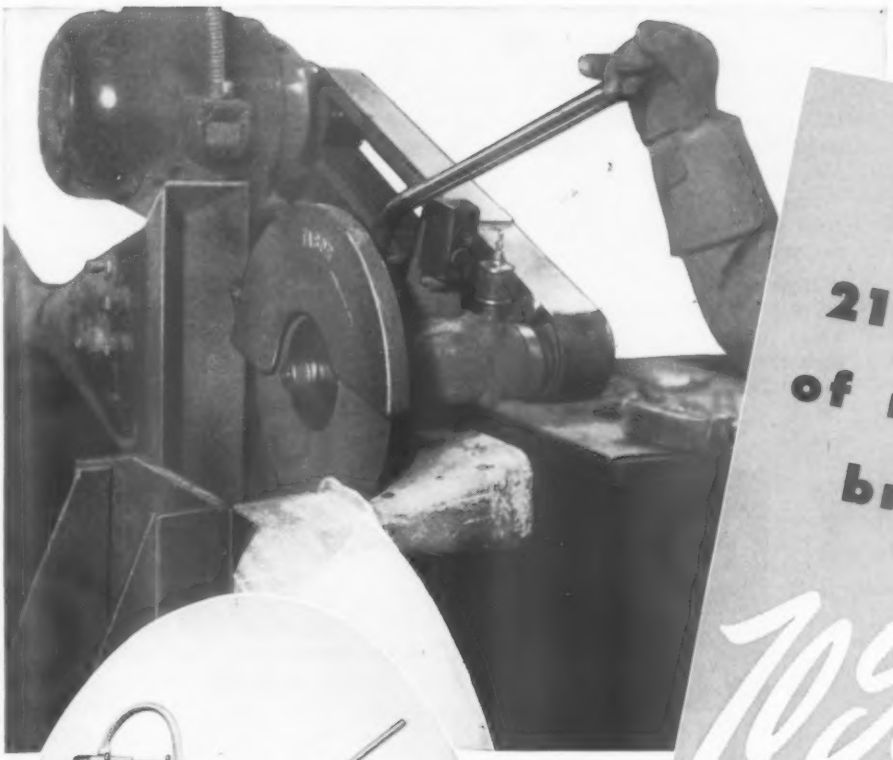
Additional groups have been formed in Seattle; San Francisco; Los Angeles; Portland, Oreg., and the state of Connecticut, which group includes part of Massachusetts.

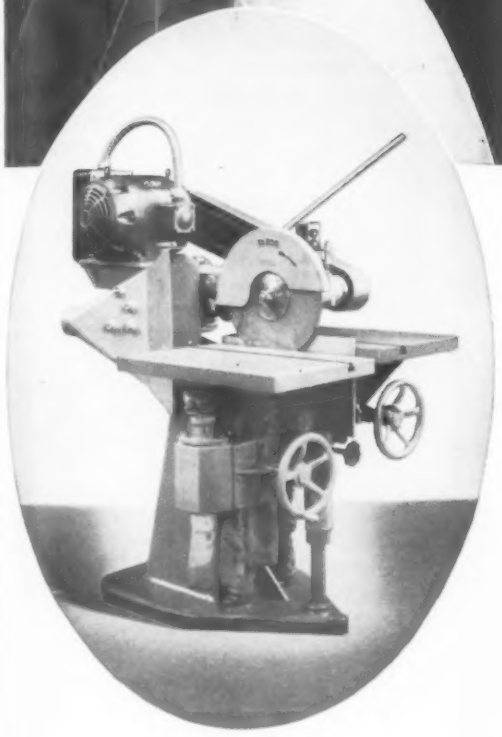
Chairman of the Seattle group is Joseph Long, Atlas Foundry & Machine Co., Dennis Vena, American Foundry Co. Inc., Seattle, is vice chairman; W. Orphan, Lake Union Foundry Co., Seattle, treasurer, and J. S. McNeill, American Foundry Co. Inc., secretary.

The San Francisco group elected S. D. Russell, Phoenix Iron Works, Oakland, Calif., temporary chairman. Officers will be elected at a future meeting as will those of the Los Angeles and Portland groups.

Temporary chairman of the Connecticut group is Arthur E. Enquist, Connecticut Foundry Co., Rocky Hill, Conn.

Eck Foundries Inc., Manitowoc, Wis., has been incorporated by William C. Dell, Robert J. Davison and Raymond T. Zillmer, to conduct a general foundry business.





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10 H.P.	36" x 25"	16" Max. Thickness—5/32"	20" (with head over table) 46" (with head swung to side)
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All motors fully enclosed, fan-cooled, ball bearing			

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(*Continued from page* 95)

made the last 15 years in the field of iron castings, the president emphasized the development of high-duty cast iron, which now offers a reliable and consistent engineering material. The steel castings industry is improving its efficiency and tends toward more specialization. Work is being carried out on oxygen enrichment of the Tropenas furnace. In the field of malleable castings there has been some development in using the gaseous treatment for the malleabilizing process. The problem of "peeling" has been the subject of a symposium of papers read before the Iron and Steel Institute earlier in the year.

Light alloy castings have been greatly developed during the war years, particularly in aircraft construction. High tensile brass castings have been substituted for forgings with economies of cost, time and forging capacity. A notable development on nonferrous material is "Nimonic 80," a nickel-chromium-titanium alloy evolved for gas turbine and jet engines.

Presentation of the Edward Williams Lecture followed the presidential address. The lecture was contributed by Dr. Harry A. Schwartz, Cleveland. The subject was "Some Unsolved Problems in the Metallurgy of Black Heart Malleable." As Dr. Schwartz was unfortunately unable to present the lecture in person, the text was read by A. E. Peace, of Leys Malleable Castings Ltd., Derby. A vote of thanks to Dr. Schwartz was adopted with acclamation. (Text of Dr. Schwartz' paper was presented in THE FOUNDRY for July.)

Produced Nodular Cast Irons

H. Morrogh and J. W. Grant, of the British Cast Iron Research Association, contributed a paper on "Nodular Cast Irons, Their Production and Properties." At the 1947 conference of the Institute of the Institute of British Foundrymen, Morrogh and Williams had given a paper describing the preliminary work leading up to the prediction of the possibility of producing nodular cast irons. Further accounts of the development of the process were given at the meeting of the Iron and Steel Institute held in May this year. The present paper gives an outline of the process and a detailed description of the mechanical properties of typical nodular irons. The authors mention that the work will be amplified and modified at a later date as more results and experience are obtained.

Dealing with the mechanical properties, the authors state that nodular cast irons are still relatively nonductile, but there is evidence that by appropriate heat treatment they may develop a measure of ductility. Compared with flake graphite irons, nodular cast irons can be produced having transverse rupture stresses and tensile strengths as good as, or better than, those of accepted high-duty cast irons. These high values may be obtained at a relatively low level of hardness and with shock resistance figures as high as two to four times those of high-duty gray cast irons. Damping capacity of nodular irons is appreciably lower than that of any flake graphite cast iron. In general, nodular irons possess mechanical properties which might render the material particularly suitable in the field of engineering applications.

Commercial production of nodular

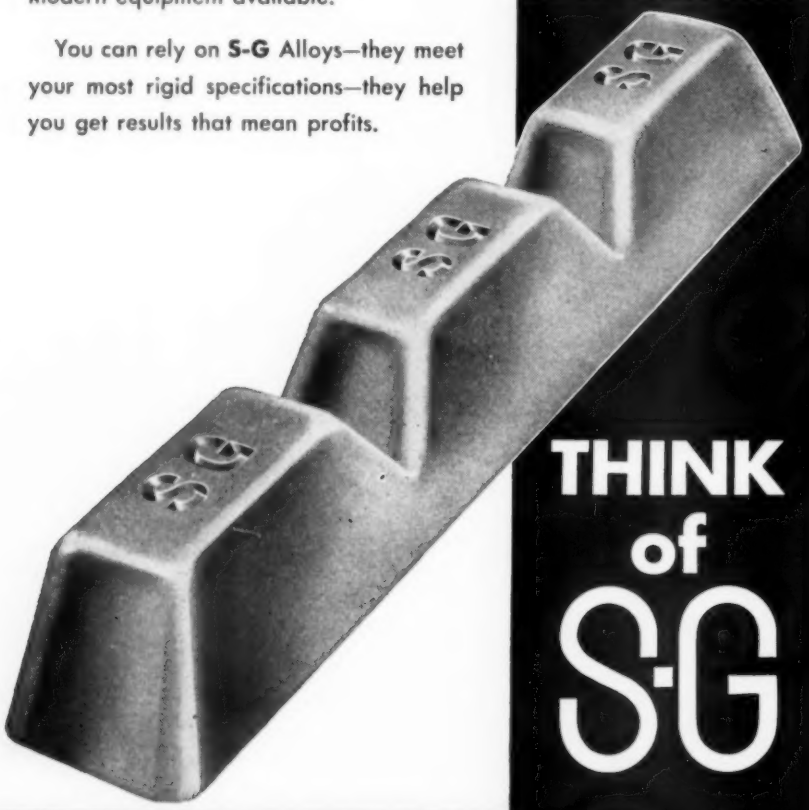
(*Continued on page* 236)

TROUBLE-FREE PRODUCTION of quality castings doesn't just happen. The skill and know-how of diecaster or foundry is of prime importance. But the most skilled of craftsmen must have the right raw material to work with.

Whatever your casting problem may be —die cast—permanent mold or sand cast. Specify **S-G** Aluminum Alloys. Every step in their production is checked constantly by skilled laboratory men using the most modern equipment available.

You can rely on **S-G** Alloys—they meet your most rigid specifications—they help you get results that mean profits.

When You Think of Aluminum



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Smith L-O Core Oil

VULCAN . . . Largest Figure Cast in Iron is a Symbol of Birmingham

Vulcan, mythological god of fire and metals, is the largest figure cast in iron . . . is second only to the Statue of Liberty in the United States. This statue, regarded as a symbol of Birmingham, is 53 feet tall and weighs 60 tons. The entire project was done by the Birmingham Steel and Iron Co., under the supervision of the firm president, J. R. McWane. Mr. McWane is also founder of the McWane Cast Iron Pipe Co.

Casting this statue of Vulcan was a difficult job . . . a job that called for months of planning, days of set-up, and the right basic materials — like Smith L-O Core Oil.

No matter what type of casting problem you might have — whether it's jobbing or production work, or even extra-curricular jobs like Vulcan — there is a Smith L-O Core Oil to give you top results. This high-quality product is available in 20 grades. It is the *only* core oil processed by the Dow-Therm method of heat control; assuring you greater homogeniety and uniformity. Ample stocks of Smith L-O Core Oil are maintained at all times by Foundry Service Co., Birmingham; W. J. Bach, president.

Vulcan stands on a pedestal 124 feet high, surveying the city of Birmingham from the top of Red Mountain. It was cast in 1903 and represented industrial Birmingham at the Louisiana Purchase Exposition.

INDUSTRIAL OILS DIVISION

CORE WASH • ROD DIP • LIQUID PARTING

SMITH OIL & REFINING CO., *ROCKFORD, ILLINOIS*

(*Continued from page* 234)
cast irons has to contend with two main difficulties: High carbon contents, and the low sulphur contents required. It is not essential to desulphurize cupola-melted metal but, unless this is done, a considerable waste of the cerium alloy used in the process will occur. If basic-lined ladles are used, the soda ash process for desulphurization is efficient.

Replying to questions, Mr. Morrogh said that if the alloys are rapidly cooled, the result will tend to give 100 per cent nodular structure. Special methods are required in running and feeding and, generally speaking, the fluidity of nodular irons is less than for ordinary irons. Surface finish of the casting is at least as good as for ordinary irons. The author agreed that a nodular structure can also be obtained by the use of magnesium as an alloy, and possibly other methods might also give results. Mr. Morrogh said that when submitted to constant elevated temperatures, the resistance to growth of nodular iron is rather better than for other irons, but the resistance to thermal shock caused by repeated heating and cooling may be a little less good. Field tests must be made to ascertain certain properties of nodular iron if used for large castings of, say 5 tons and over.

Replying to another question it was stated that there appeared to be no special difficulties in regard to castings with varying thicknesses. Mr. Morrogh agreed that for certain applications flake graphite irons may be better than the nodular type, especially in regard to damping. Answering another question, the author confirmed that if a white iron was obtained it could be reclaimed by heat treatment.

A paper entitled "A Study of Residual Gases in Cast Iron" was contributed by Dr. J. E. Hurst and Dr. R. V. Riley, of the Staveley-Bradley Foster research department. The authors described the method they have used to determine gases in cast iron with vacuum fusion equipment. With regard to segregation of gases they found no evidence of this in the work reviewed in the paper, but they add that the tests applied were not sufficiently searching to detect the presence of segregation on a micro scale.

Gas Content May Change

They state with some confidence that the gas content of a cast iron may be changed during a remelting process. The direction of the change is partly dependent on the melting unit and partly on the initial gas content of the iron. Irons of similar composition on remelting tend toward a stable gas content which appears to depend largely on the nature of the furnace and operating technique.

Dealing with the significance of gas content in the production of sound castings, the authors found that in sound castings of silicon iron the residual hydrogen content seldom exceeded 2 milligrams per 100 grams or 2 parts per million; in sound castings the oxygen was also low, a typical value being 10 parts per million. If the hydrogen and oxygen were present in amounts greater than the limiting values given, difficulty was experienced in the production of sound castings.

In all the work on gases in cast iron a loose relationship between hydrogen and oxygen has been noted which is almost certainly not merely coincidental. The ratio of hydrogen to oxygen in a given iron is possibly more important than either element alone in governing the properties of the iron. In contrast to the other two gases, the oc-

(*Continued on page* 238)

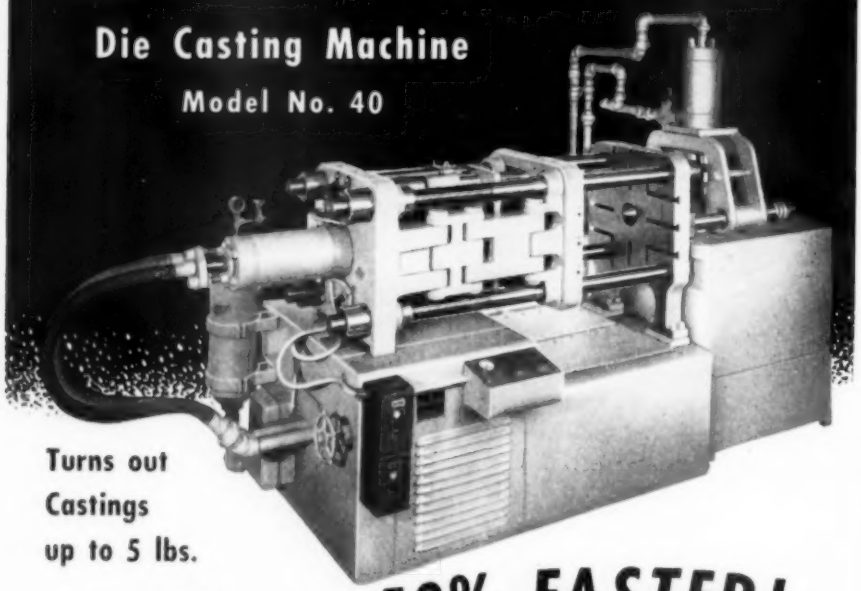
...Introducing

A REVOLUTIONARY NEW

"CAST-MASTER"

Die Casting Machine

Model No. 40



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...10% to 50% FASTER!

A "natural" for shops doing small or medium castings or shops needing a supplementary machine to handle smaller dies

Catalog and Specification Sheet available on request

A die-casting machine, designed by leading die-casting engineers, to produce light and medium castings at a rate of speed and efficiency heretofore considered impossible. Precision-built, it offers the same rigidity, the same superior construction as other famous Cast-master models . . . plus added exclusive features that speed up production and cut operating costs to a NEW LOW.

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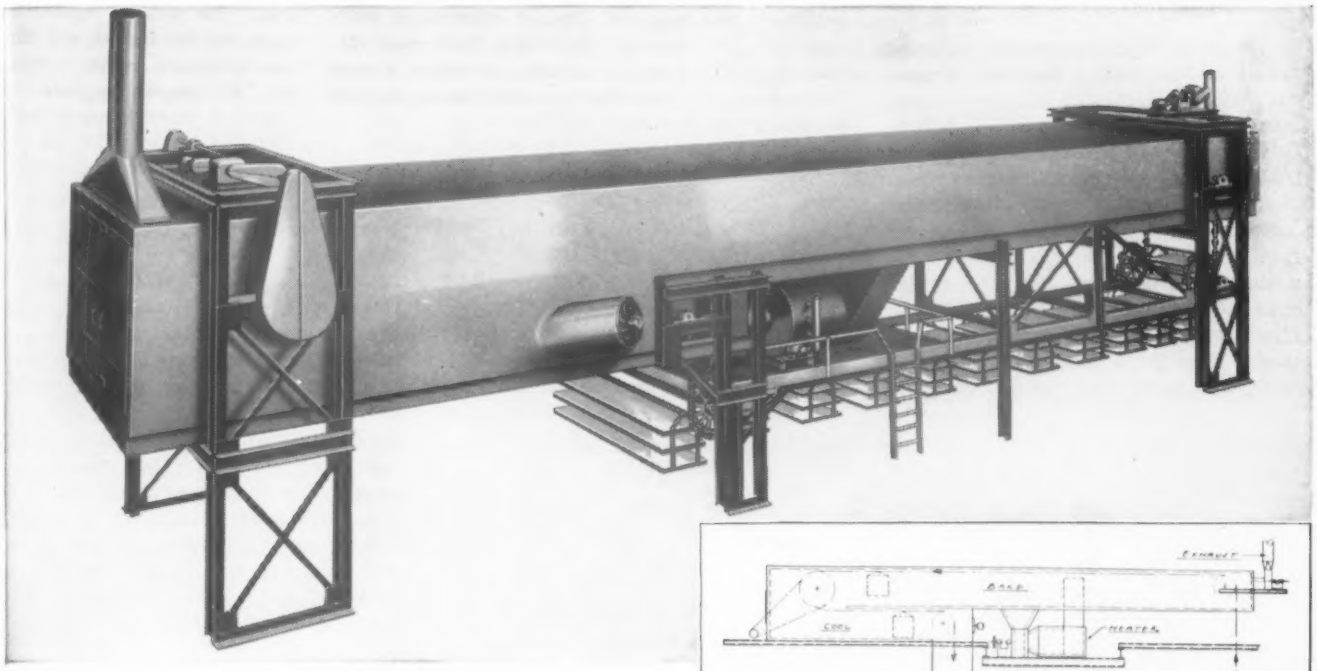

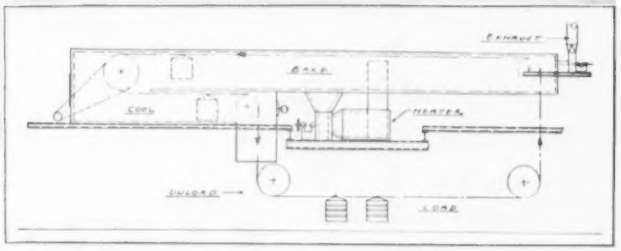

The time-saving, space-saving, compact design of this new Horizontal Core Oven is characteristic of Young Brothers' Engineering. Into it went the skill and confidence of many years of experience . . . also a thorough knowledge of the job to be done and the production problems involved.

This new core oven can be installed in practically any building without making any major structural changes.

The coremakers are located right next to the oven so that they can load the cores directly on the moving racks thus eliminating the necessity of transporting them on hand trucks or a conveyor from the core room. The location of the coremakers, at the oven, also saves core room space.

The size of the loading racks can be varied and the shelves can be adjusted to accommodate cores of many sizes and shapes.

Besides allowing for the removal of exhaust gases at the point of greatest concentration, the new oven design provides an effective cooling zone for the cores and assures comfortable working conditions for the coremakers.

This New Horizontal Core Oven is Young Brothers' answer to the demand for better core baking equipment. It is YOUR answer to the need for lower production costs and higher operating efficiency.

New HORIZONTAL CORE OVEN . . . . . offers many cost saving advantages!

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ESTABLISHED IN 1896

(*Continued from page* 236)

currence of nitrogen in iron is confined within fairly narrow limits, ranging from 10 to 60 parts per million. No correlation has been found between the residual nitrogen content and any of the foundry or mechanical properties of the iron.

Regarding the presence of SO_2 in cast iron, Dr. Riley said that the authors had not detected the presence of this gas in their analysis. Similarly in regard to hydrocarbon gases, although a faint smell was noticed, the apparatus did not disclose any. F. Hudson referred to work done by the British Nonferrous Research Association in which it was found that gas was found to increase in phosphor bronze with the phosphorus content. Dr. Riley did not concur with this in regard to cast iron. He agreed with Mr. Hudson that moisture had an effect and that if the molds were dried the effect of gases, particularly hydrogen, was partly eliminated. H. J. Young said that he believed that cast iron inherited properties from the ore and the scrap used for making the pig iron. The authors replied that this point was not settled, and that theirs was an interim report, without finality. E. Longden suggested that the so-called inherent properties of cast iron may be due to minute quantities of metals hitherto undetected.

C. R. Tottle, lecturer in metallurgy, University of Durham, gave a paper on "Plastic Flow in Cast Iron, at Room and Elevated Temperatures, with Special Reference to Relief of Stress." The author considers the deformation characteristics of cast iron, specially in the relation between elastic and plastic flow, to be susceptible to considerable variations, according to the mode and speed of application of stress. The total deformation arising from any test at room temperature can be increased, and the ratio "elastic" to "plastic" decreased, merely by slow loading, or periods of aging between successive increments of stress.

Study Plastic Flow

The experimental method used is that of stress-free bars loaded in transverse bending, followed by study of the plastic flowing taking place with time. Incremental stressing gives perfect translation of elastic into plastic deformation in remarkably short periods of time at room temperature, resulting in severely deformed cast iron bars, normally unobtainable in routine testing. The influence of this aging under stress is considered in weathering as a form of stress relief treatment. At elevated temperatures, the rates of flow and the total deformation are naturally much increased, and the application to stress relief shows that high temperatures of the order of 450 to 500° C are necessary for high-duty unalloyed iron, and 550 to 650° C in the case of alloy additions, where 70 per cent relief and upward is desired.

R. B. Templeton, opening the discussion, confirmed that castings treated at 600° did not distort. Replying to M. Hallett, who recommended the use of ring test pieces, the author said that he used these for steel castings and found them satisfactory. In regard to the time during which samples should be heat treated, he said that at 700° seven minutes should be enough. Dr. A. B. Everest said the paper justified the process of weathering; commenting on this the author said that he did not think that there was much difference between inside and outside weathering.

P. A. Russell said he still believed that stress relief by heat treatment was by far the most satisfactory. H. J. Young said that he thought

Ajax phosphor copper,

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castings were better weathered out of doors, especially unmachined castings.

The exchange paper from the Association Technique de Fonderie de France was entitled "The Maurer Diagram and its Evolution and a New Structure Diagram for Cast Iron." The author was Dr. H. Laplanche. In his absence the paper was presented by Dr. A. B. Everest. The author dealt first with the influence of structure on the mechanical properties of cast iron, dealing separately with the part played by the graphite and that played by the matrix. He then discussed the choice of a cast iron for a given purpose in the following form: What is the chemical composition which is suitable, within given tolerances, for a given casting to obtain a metallographic structure fixed beforehand, when the law of cooling for such a casting is also determined?

He then criticized the Maurer diagram, saying that "if one shows the contents of total carbon and of silicon on two axes of rectangular co-ordinates, the areas obtained relative to the given structures will only be *a priori* valid for the constant speed of cooling ascertained by tests. *A fortiori*, it can be said that one obviously could not put on the same binary diagram the structure obtained with different speeds of cooling; yet this is the mistake which was made by Maurer.

Two-Curve Diagram Proposed

The author discussed various modifications of the Maurer diagram arrived at by different workers. He proposed a diagram on which two sets of curves are superimposed, one set being curves obtained by assigning arbitrary values for the product of the silicon in the carbide and the weight of the eutectic carbide, the other showing straight lines being the linear expression of a calculated relation both sets of curves having the same coordinates. In this way every cast iron is found at the intersection of a curve from the first set with a straight line of the second set. The straight line gives the position of a cast iron in relation to the eutectic, the curve gives the structure of the matrix. Thus the appearance of the fracture is given. The information given completely defines a cast iron for a given law of cooling.

Dr. H. T. Angus, discussing this paper, said that Maurer, in his diagram, did show that one could get pearlitic iron over a wide range of compositions. He remarked that all workers who had made modifications to the Maurer diagram had ignored the effect of phosphorus. He said that all these diagrams were only approximations, and a line represented a zone of uncertainty.

A paper on "Steel Castings for Aircraft" was contributed by E. J. Brown and F. Rodgers, Hadfields Ltd., Sheffield. The field covered by the manufacture of steel castings for aircraft is now very wide and the paper is limited to the problems encountered in the production of the rear spar and pivot bracket for the Hawker "Tempest" and "Typhoon" respectively, and the methods adopted to overcome them in the foundry with which the authors are associated. A description of the choice of steel, molding technique and heat treatment in each case is given. In view of the rigid requirements demanded by the specifications, a section of the paper deals with testing methods; x-ray examination was used and a special machine was devised to apply a proof loading test. Clover leaf test bars were used for routine indication of steel quality and heat treatment. Practical trials were also effected.

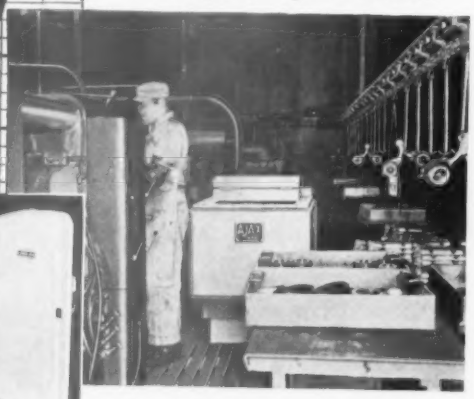
In a paper on "The Cleaning of

Over 2 Million

2,000,000
1,850,000
1,700,000
1,550,000
1,400,000
1,250,000
1,100,000
950,000
800,000
650,000
500,000

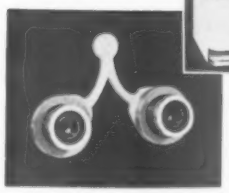
Electric Motors produced monthly in the U.S.A. -- more and more manufacturers are installing

AJAX ELECTRIC FURNACES to improve production.



Part of the modern die casting plant of the Westinghouse Electric Corporation in Springfield, Massachusetts, where thousands of rotors are cast every day for refrigerator units.

The new Westinghouse Refrigerator Model MF-7.



Cast two at a time, these aluminum motor rotors are better because of accurate temperature control and freedom from contamination made possible by Ajax Induction Furnaces.

Included in the millions of motors manufactured nationally, per month, are the hundreds of thousands of fractional horse-power motors that fill the ranks of faithful, alert and silent servants for the American home. Such large output requires ingenious production methods. A great improvement has been achieved by casting the rotors from high purity aluminum. Prominent manufacturers have recognized the advantage of using Ajax-Tama-Wyatt induction furnaces for melting the aluminum prior to casting, because of the accurate temperature control and freedom from contamination with iron or silicon.

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AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

Steel Castings," the author, A. B. Lloyd, F. H. Lloyd & Co., sets out to deal with as many aspects as possible of the processes involved in the separation of steel castings from the materials used to make the mold, exclusive of the removal of feeding heads, grinding or rectification by welding. Since the work which the fettling shop has to do is largely predetermined by molding sand practice, the author gives some space to the study of conditions which must apply in the foundry. Castings must be made in such a way that the sand and casting part company readily.

"Gas Porosity in Nickel-Silver Castings" was the title of a paper by T. F. Perason, W. A. Baker and F. C. Childs, of the British Nonferrous Metals Research Association. Cast Nickel silvers occasionally exhibit gross gas unsoundness, and the cause of this defect has been studied by small-scale melting and casting experiments. It is shown that these alloys are not seriously subject to hydrogen gas unsoundness. Gross gas unsoundness can arise from the evolution of carbon monoxide during solidification. Melting under strongly oxidizing conditions and/or deoxidizing before pouring eliminate the gas unsoundness.

Describes Aluminum Castings

Dr. E. G. West, technical director, the Aluminium Development Association, contributed a paper on "Aluminimum Alloy Casting Developments." The paper, first summarizes briefly the stages in the development of the aluminuum base casting alloys in use today, and this is followed by a section outlining the various improvements which have taken place in the processes and techniques involved in the manufacture of aluminum alloy castings. Some indication is given of the further steps which might be expected in the future development of both alloys and casting procedures. The third section of the paper reviews the fields of application of aluminum alloys and indicates the new outlets being explored, for motor vehicles and railroads, machine tool construction, and domestic and general use.

The subject of "Refractory Materials in the Foundry Industry" was dealt with by Dr. G. R. Rigby and A. T. Green, of the British Refractories Research Association. The paper discusses lining failures met with more particularly in the comparatively slow but continuous wearing back of the refractory which occurs during normal service. The opinion is often expressed that the life of a lining is almost entirely dependent on the operating conditions, while the quality of the refractory is only of minor significance.

It is true that more damage can be done to installation during the few minutes in which operating conditions have got out of control, than occurs during months of normal working. If the quality of the refractories appears to exert little influence on the life of the lining it might be argued that there is a *prima facie* case for attempting to obtain closer control of the metallurgical operation. It is obvious that as the operating conditions are more rigidly controlled, so the quality of the refractories will play an ever increasing part in determining the working life of the unit.

E. Longden, works manager, P. R. Jackson & Co., Ltd., Salford, near Manchester, gave a paper entitled "Problems of Contraction and Distortion in Cast Iron Castings." It may be deduced from the information given in the paper that, in gray iron castings of contrasting sections, or of varied cooling gradients, the thicker members contract by a greater percentage than the thinner members. If, however, the same contrasting sections be cast as simple, uniform and separate items, contraction is in line with standard allowance—that a thin section of gray iron contracts more than a thicker section for the same composition.

In the case of a casting carrying thick and thin sections, the thin sections are subjected to an extensional stress during the cooling of the metal, created by the resistance of the thicker sections which are not yet contracting. The frictional resistance of the mold and cores, and the expansion of the cores on being heated by the molten metal, will also tend to subject the cooling metal to extensional stresses. A study of the very clear arrest and expansion periods noted in the cooling curves indicates that a thick section of a casting may be undergoing an expansion at a time when a thinner section has passed its expansion phase and is in a sate of contraction. Under these conditions the thin sections will suffer extensional stress. Conversely, the thicker sections will be subjected to a compressional stress by the effort of the earlier cooled members to contract. Finally, the heavier sections, on cooling, must take up a shorter length by bending certain parts of the casting, or by fracture in the weakened or most highly stressed sections.

Accelerate Cooling Rate

The introduction of an air cooling system to accelerate the cooling rate of the zones of the casting with a high heat content is of obvious benefit in reducing stresses and removing the need for such high camber allowances. This innovation is applicable to a variety of castings which present unusual and contrasting heat gradients.

"New Ladle Methods of Desulphurizing Pig Iron" was the title of a paper by Dr. W. C. Newell, A. J. Langner and J. W. Parsons, of the British Iron and Steel Research Association. The factors examined in this paper include slag basicity, various chemically reducing conditions, agitation by gas bubbling and the addition of specific sulphur retaining elements such as barium. This is a preliminary inquiry from which the following conclusions can be drawn, and these will act as a basis for future research:

1. It is confirmed that chemically

(*Continued on page* 242)

COINS JINGLE, CROWDS PUSH, SHOVE IN PHILA.

And the Natives Are None Too Happy

Convention Hall, Philadelphia, June 23 (AP)—This city forked out $250,000 for the Republican national convention.

The consensus today is that it's going to get its money back. It's easy to pay 70 cents for an egg sulking on limp lettuce between two slices of bread. Or to put out $13 apiece to sleep two in a room.

Yet no matter how happily the cash register may ring, a lot of people around here will be just as glad when every one goes home.

You Can't Move, Chum

Taxi drivers, for instance. Their business was hurt when a motor car company decided to help advertise its new model by turning a fleet of cars over to the convention.

"And this crowd," a cabbie mourned as he crept along Broad st., "you can't move, chum. These people are no fancy tippers, either. I'm running $2 below what I do on a normal day. It's nothing like that foundryman's convention we had here. That, chum, was a convention."

Editor's Note: The above item from the *Chicago Tribune* was carried as an AP dispatch in newspapers of the country's leading cities. It also was broadcast over a nationwide radio network.

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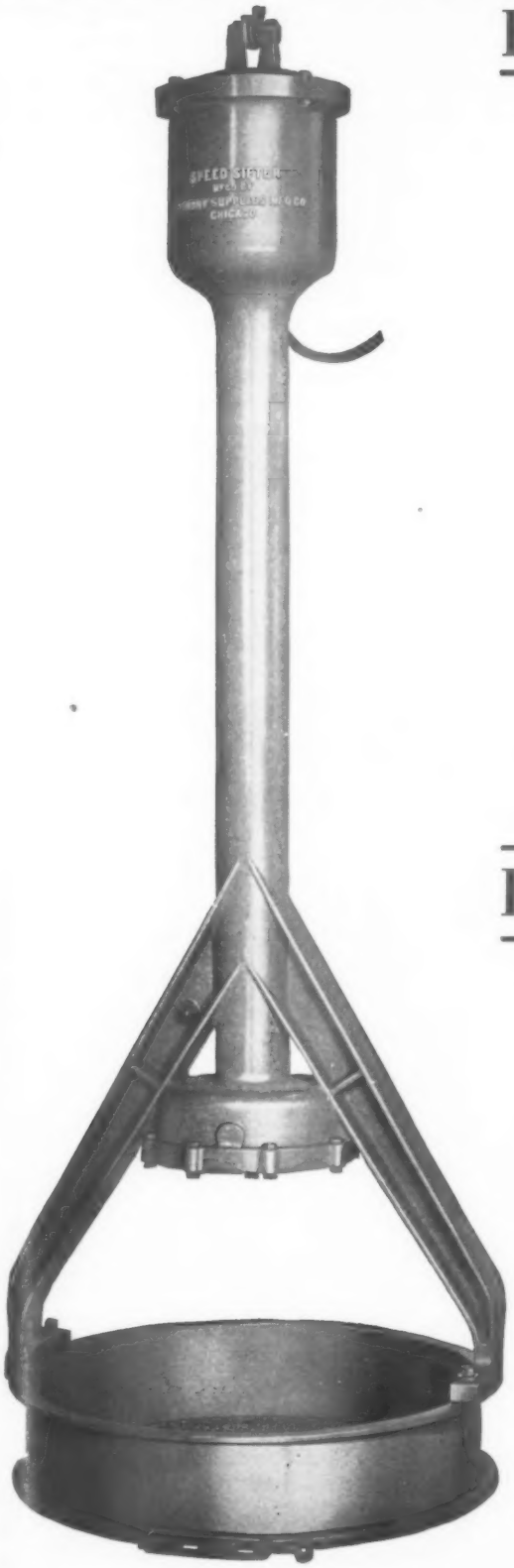

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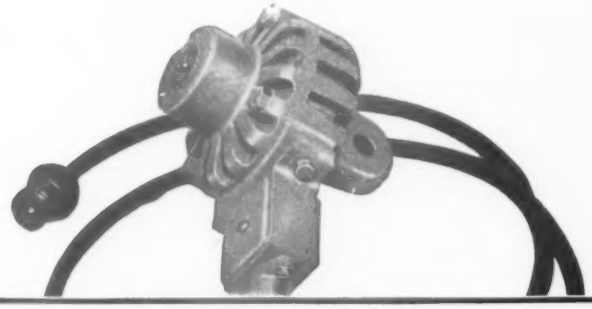
The ROTOPLANE Speed Sifter is an *improved* sand riddle of much greater capacity and much longer life. One size and type serves all purposes in the foundry—does *all* your sifting more quickly and economically.

It is easily handled by one man, weighs approx. 90 lbs., is 62 in. high overall. The one-piece frame of tough aluminum alloy makes for a remarkably effective vibration. Its smooth, free, rotary action vastly increases bearing life; all bearings grease packed. All mechanism of the ROTOPLANE is *completely* enclosed—no bearings or activating parts of any kind exposed to dust and grit.

The Quick-Change Sieves are instantly interchangeable, mounted in smooth, flat steel ferrule, with 20-inch diameter clear sifting area. No jagged edges to tear workers' hands, no storage problem.

$210.00 f. o. b. Chicago — complete with cable, safety ground wire. Standard 1/3 h. p. motor, 110 volt, 60 cycle, single phase.

UNIVERSAL FREE - WHEELING model equipped with motor as above $195.00



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True-to-pattern castings make satisfied customers . . . more repeat business. Increase your production and castings quality with RED Electric Vibrators. Sturdy, dustproof, lowest operating cost (electricity does not freeze). Unequaled for consistent year-'round results in foundries all over the world.

(All Prices f.o.b. Chicago)

No. 1—Light match plate work	**$12.00**
No. 2—Medium match plate work	**15.60**
No. 5—Heavy match plate, tub and bench work	**20.40**
No. 9—Machine and heavier work	**28.80**

Third (ground) wire per U. S. Govt. code—furnished with No. 9 at no extra cost; $1.20 extra with Nos. 1, 2 and 5 vibrators.

KNEE SWITCHES for operating Red Electric Vibrators: Single pole $3.60, Double pole $4.80.

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save replacement time, because they retain the correct orifices LONGER. They are remarkably light, outlast cast iron, reduce operating costs to a minimum, and are attractively priced. Ask for a trial order. . . .you will discover for yourself that PYRAMID CERAMIC NOZZLES *are "best by test."*

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ASBURY GRAPHITE MILLS

ASBURY, N. J.

(*Continued from page* 240)

basic and reducing conditions are favorable for desulphurization.

2. It is shown that a highly basic calcium silicate slag is effective as a desulphurizing medium provided fluidity is maintained by fluospar or other additions.

3. It would appear that the predominant controlling factor is the mechanism of transfer of the sulphur from the metal to the slag, and that slag fluidity and intermixing with the metal are all important.

4. The role of nitrogen when bubbled through the slag appears to be solely that of a mixer of slag and metal, and no desulphurizing action proportional to the volume bubbled has been observed.

5. The most favorable desulphurizing process so far tried has incorporated all the above factors, including chemical basicity and state of reduction together with intermixing, and was obtained by the addition of about equal weights of limestone and calcium nitride. Whereby there was a violent liberation of gas.

A. Young, of the British Bath Co., Ltd., Greenford, showed a film with a short paper entitled "Bath Making".

Foundry Planning Discussed

A Swedish contribution was presented by Jorgen Drachmann, vice managing director, A/B Svenska Strebelverken, Vastervik, Sweden, the title of the paper being "Some Fundamental Problems in Foundry Planning." No standard plan covering all sorts of foundry work can be given, so the paper has been divided into the following sections: (1) The planning of a few products produced at an approximately constant rate; (2) the planning of products subject to seasonal variation; (3) the planning of products to be sold from stock, and (4) the planning of jobbing orders. In each case the author has shown how to apply two main principles, namely:

1. (1) The principle of total load, which means that a planning system never can work well if somewhere in the system the total load of orders is not taken into account. If this principle is not followed the promises of future deliveries must be mere guesswork.

2. The principle of margin, which means that, however well the foundations of the system are in accordance with the work, a certain allowance for unexpected troubles like illness, absenteeism, shortage of material, etc., must be taken into account if delivery times are to be

(*Continued on page* 244)

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(*Continued from page* 242)

kept.

The official exchange paper from the American Foundrymen's Association was by Ralph L. Lee, Grede Foundries Inc., Milwaukee, chairman of the AFS Cost Committee, who chose for his subject, "Do You Use Your Cost System?" In the absence of the author, the paper was presented by V. Delport, THE FOUNDRY, and member of the Costing Committee of the Council of Ironfoundry Associations. The author stresses the point that no cost system is of real value unless it can be, and is, used to judge current operations and accurately to forecast results. The main object of the paper is to give a detailed method of dealing with labor costs, with special emphasis on the necessity of assessing and checking "excess labor costs" and tracing those departments of the foundry which are responsible for such excess costs.

Gives Details of Method

The paper first explains in detail how the production and daywork tickets are prepared in each of the foundry departments; the latter part explains how these tickets are handled at the wages office. Finally the author explains the procedure for computing labor losses on completed castings, and the method of dealing with production tickets in order to extract statistical information.

The discussion that followed centered mainly on the fact that the production and day work tickets are filled in by the operatives or the foreman, which, it was thought, constitutes an unreliable method; the point was made that the tickets would, in some cases, be hardly readable after having been handled on the foundry floor. It was also said that the procedure described would be worth while in a large foundry, but it would increase the cost of management unreasonably in a foundry of moderate size.

A paper entitled "Metallizing in Relation to Foundry Practice" was contributed by J. Barrington Stiles, Metallizing Equipment Co., London and Chobbam. This paper describes some of the commoner applications of metal spraying in connection with foundry work, and explains the operation of modern metallizing equipment. It also includes information concerning the physical characteristics of sprayed metal. The main applications of metallizing in foundry work are in relation to coating, metallizing patterns, coatings to resist

(*Concluded on page* 246)

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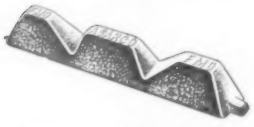

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(*Concluded from page* 244)

heat oxidation, and the salvaging of defective castings.

Replying to a question as to whether wood patterns used under a sandslinger would better stand abrasion if they were coated, the author said that in some cases, instead of using a metal wire, it would be possible to flow a plastic in which hard particles such as boron would be embedded. He also said that square wood patterns could be sprayed without warping if the whole pattern is coated. He confirmed that it is possible to spray a metal of high melting point onto a metal of lower melting point.

Debates Testing Methods

The official exchange paper of the Association Technique de Fonderie de Belgique was presented in person by J. Leonard, past president of the Belgian association. His subject was "Application of the Brinell Test in the Foundry." The author raises the question of the tests on separately cast test pieces vs tests taken on the casting itself, a problem which has been debated for twenty years, and which is not yet solved satisfactorily. The author said "The test bar cast separately qualifies the metal molded and cast under the best conditions; it must show the maximum of its possibilities. We admit this. However, the metal cast in the mold is found there but sometimes under very different conditions and its characteristics may be considerably diminished; we belong to those who believe that they must be valued, if not measured.

"We are of the opinion that the hardness test is able to solve this question, partially if not wholly. For a given cast iron there must be a more or less precise relation between resistance to fracture, and hardness. The British committees have issued technical specifications showing, for each type of cast iron and different diameters, the required characteristics. Would it not be sufficient to take the brinell hardness of these bars at the fracture section and draw the relation sought for."

Dr. A. B. Everest said it was the general view that tests on separately cast test bars gave the qualities of the metal only. On important castings it is necessary to test the casting itself. He agreed that the hardness test gives useful information but said this confirmed the necessity of testing the casting itself.

A series of works visits was organized in the afternoon of Thursday, June 10 and the whole day on the Friday.

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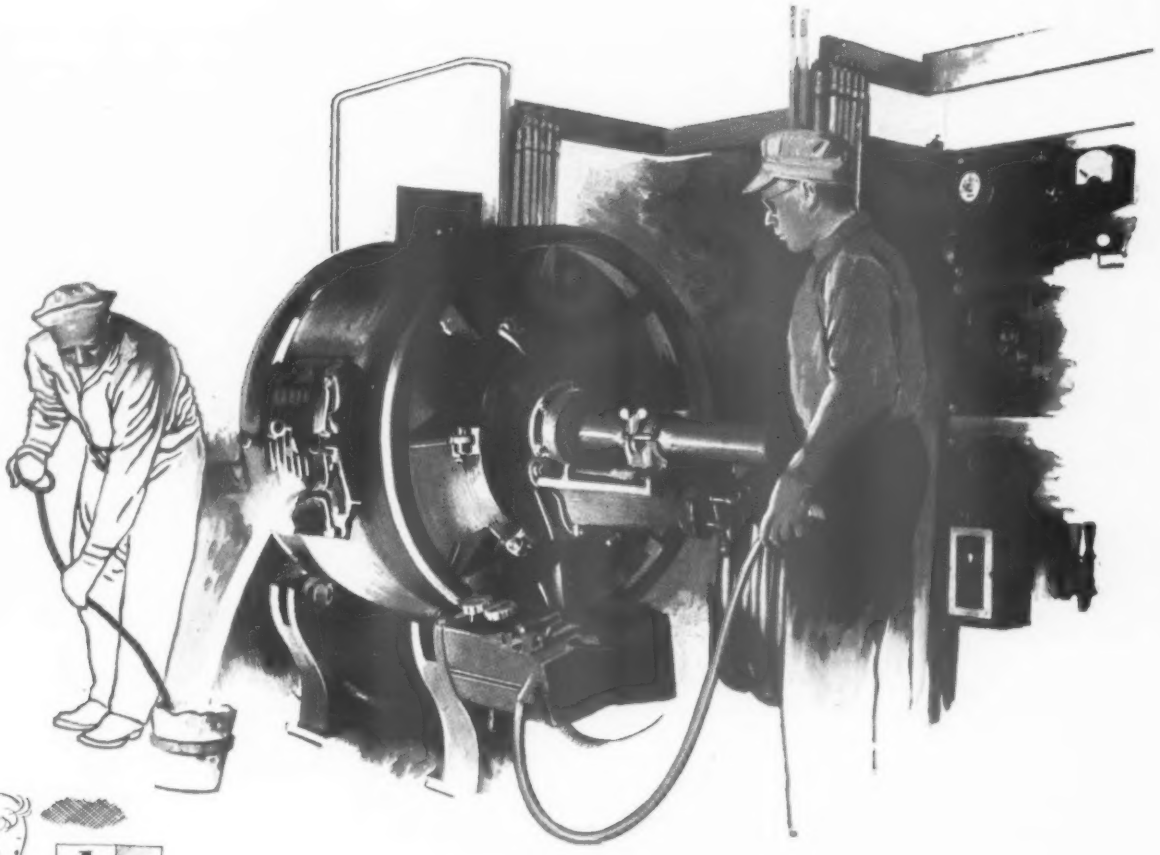

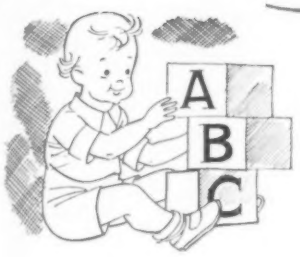

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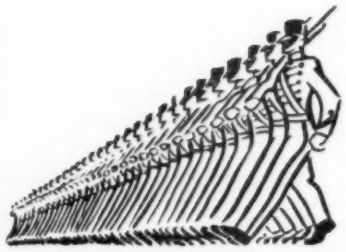

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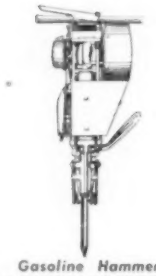

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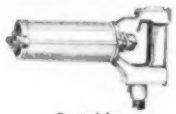

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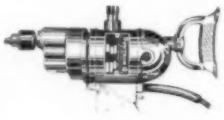

Portable
ELECTRIC DRILLS

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Portable
ELECTRIC SANDERS

INVESTMENT CASTING AT ALLIS-CHALMERS

(*Continued from page* 81)

moves the pattern.

Besides being designed for this automatic ejection of the patterns, dies are constructed with water channels for connection to a cooling water circulation system. The only manual operations remaining after removal of the pattern, are lubrication of the die and pushing a button to start the next cycle.

From the injection machines, patterns are taken to tables for inspection and assembly. At these tables the individual patterns are attached to wax sprues with the aid of heated tools and melted wax, as shown in Fig. 2. Sprues are specially designed for each type of pattern, to give proper support of the patterns in the flask, to leave passages for drainage of the wax as it melts out, to get the maximum number of patterns in the flask, and to provide passages for proper distribution of metal to give sound, dense, castings.

Dipped In Fine Slurry

Each assembled set of patterns is dipped in a primary investment slurry composed of fine silica and a solution of sodium silicate which acts as a binder. Before this coating dries, a slightly coarser silica is sifted over it to strengthen the coat and to provide a roughened surface to which the secondary investment will adhere.

Investment, consisting of ground firebrick, silica sand, and a small percentage of magnesium oxide, is blended in the dry state and piped to a rotary mixer where it is combined with the liquid silicate binder.

Molds are prepared by fastening a pattern group to a bottom plate with wax, setting the 18-8 stainless steel flask lined with water-proof paper over the pattern (Fig. 3), and sealing the flask to the plate with wax.

The flask then is filled with the secondary investment (Fig. 4) and set on a vibrating table for 30 to 45 minutes to settle and pack the investment completely around the pattern group. Vacuum treatment to prevent small surface bubbles is not necessary, since the pattern surface has already been coated with the primary investment. This two-coat system also enables a fine grade of investment to be used to form the surface of the cavity into which the metal will be poured, while a less expensive and more permeable material can be used to fill out the

(*Continued on page* 250)

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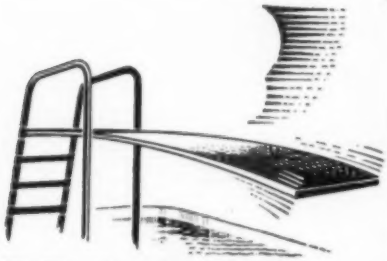

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(*Continued from page* 248)

flask.

After the vibrating, surface liquid is decanted and the excess paper is cut away before the flasks are stored to permit the investment to set.

Preliminary wax removal is accomplished on a steam table. The bottom plate of the flask is removed, and the flask is set over a hole on the table. Most of the wax melts out and is collected for reuse in sprues. The flasks then make a 5 to 8-hour trip through a gas-fired pusher oven, (Fig. 7) where three zones with temperatures ranging between 200°F and 1800°F volatilize the remaining wax and preheat the mold for pouring.

Metal is melted in 30-kva, 9600-cycle induction furnaces (Fig. 8), each holding about 35 pounds, and is transferred to the molds by ladle. After removal from the oven, flasks are set on a circular pouring table (Fig. 12), which can be rotated to bring each flask to the most convenient pouring position.

Standard gravity-head pouring is used almost exclusively, although for certain special designs having very thin sections, vacuum pouring may be used. Since these pouring methods do not limit the amount of metal melted at one time, comparatively large batches can be melted, making accurate metallurgical control possible. In addition, complicated pressure or centrifugal casting equipment is not needed.

Gates Cut With Band Saw

After cooling for about five hours, castings are knocked out of the flask by an air hammer (Fig. 9). Remaining investment is removed in an airless blast unit and by sandblasting. The individual pieces are then cut free from the group on a special bandsaw which uses a standard blade, but which operates at very high speeds, and is capable of cutting almost any metal. For unusually thick sections of the harder metals, friction saws are available.

Minor imperfections are removed and roughness at the gate is smoothed over on a variety of different sizes and types of grinders, and the part is then ready for inspection. Visual and dimensional inspection is given all parts, and plant facilities are available for all types of chemical and physical tests, and x-ray inspection, when desired.

Among the many development projects carried out at the Allis-Chalmers foundry, probably one of the most interesting is the casting of blades for the company's coal-burn-

(*Concluded on page* 252)

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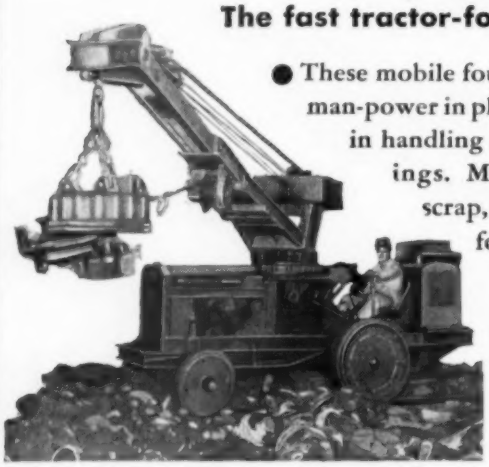

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(*Concluded from page* 250)

ing locomotive gas turbine. Made of S-590 high-temperature alloy, these complicated shapes are being cast to extremely high standards of accuracy and surface finish. The largest of these blades is about 10 in. long and 3½ in. wide, making it probably the largest blade ever successfully cast in a precision foundry.

The largest production casting made so far is a 10-lb stator disk with integrally-cast blades. The casting is done with such accuracy that no machining is required on the contour of the 29 blades on the inside diameter of the stator, nor on the 30 blades on the outer periphery of its 8-lb companion rotor.

Elimination of many or all machining operations when a part is precision-cast is demonstrated dramatically in a grater now being produced for a high-speed vegetable juicing and pulping machine. On the face of this 3-in. stainless steel disk, 420 teeth are formed with points sharp enough for use as cast, eliminating complex machining and grinding operations otherwise required.

Among other interesting products made are the following: Steam turbine spindle and cylinder blades; stainless steel castings for the food industry, including parts for doughnut machines, milk bottle filling machines, vegetable pulping machines, and beer barrel tap centers; high-velocity water jet nozzles for the Allis-Chalmers streambarker; heads for a new type of golf club; parts for circuit breakers, generator brush holder assemblies, and other electrical equipment; dozens of intricate levers, cams, and other parts for an industrial sewing machine manufacturer; and agitator vanes and vane clamps for the Allis-Chalmers Hi-Density feeder.

Materials Handling

Series of 16-mm sound films on modern materials handling methods are being offered on a loan basis by Industrial Truck Division, Clark Equipment Co., Battle Creek, Mich. Electric battery-powered and gas-powered fork lift trucks and towing tractors are shown at work, in operations that include many phases of modern packaging, loading and handling. Film titles are:

"Material Handling Newsreel, Issue No. 1," "Building the B-29," "Modern Material Handling Methods," "Clark Modern Material Handling Methods," "Material Handling Newsreel, Issue No. 2," "Moving White Gold."

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- **Comes Assembled—Easy to Install.** This self-contained unit is factory-wired, built lower and more compact.
- **Improved Uniflow Heating System** and duct work permit faster and more efficient preheating, drying and baking of cores.
- **Unit Fan and Heater** are enclosed in an insulated box which mounts on top of oven body Ducts are easily connected.

DESPATCH customers said the popular *Coremaster* drawer type foundry oven *couldn't* be made more useful . . . and DESPATCH engineers accepted the challenge! Now *you're* the judge . . .

Always ready for special rush or test jobs, the *Coremaster* is ideal for regular production baking, too. And it bakes *better* cores *faster* now with the improved DESPATCH Uniflow heating system

The new *Coremaster* bakes thick and thin cores at the same time and even in the same *drawer* With an extra removable shelf, you can *double* the capacity of a deep drawer for shorter cores.

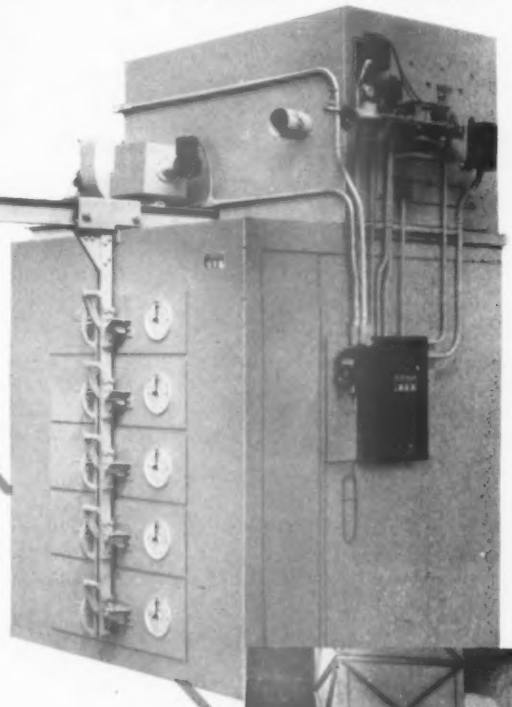
Drawers load singly or all at once—clock faces show when loads should come out. No heat escapes while loading or unloading—a rear plug on each drawer seals the oven chamber A rugged latch lifts the drawer and most of weight is carried on the overhead trolley, making drawers easy to roll

The new DESPATCH *Coremaster* comes in 24 standard models in 3, 4 or 5 drawer types. Drawers range from 30"x36" in size up to 48"x72"; in depth from 8" to 18"

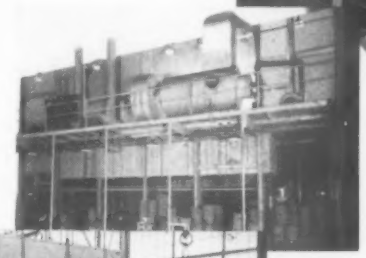
WRITE today for new Bulletin J-32.

DESPATCH OVEN COMPANY

Minneapolis Office: 619 S. E. 8th St Chicago Office: 221 N. LaSalle St.



VERTICAL CONVEYOR oil-fired Despatch Oven. Bakes up to 5000 lbs of large or small cores per hour Has built-in cooling section



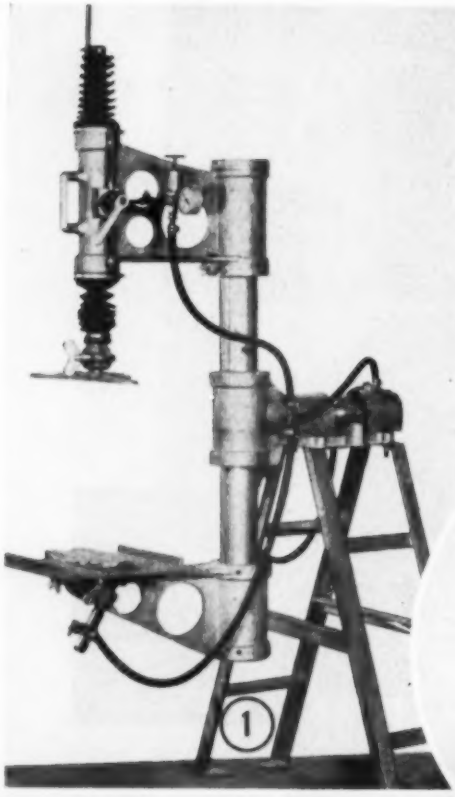
CONTINUOUS-CONVEYOR Despatch Oven with combination gas-oil-fired heater Conveyor has 38 racks SIZE: 52' long, 13' wide, 27' high

CAR-LOADED OVEN with combination gas or oil-fired heater. Bakes up to 40 tons per batch. Models available up to 200 tons per charge.

DESPATCH OVEN COMPANY

NEW Equipment AND Supplies

(1)—Core Machine: Valley Mfg. Co., Cherry Valley, Ill.—Core machine is built to make cores which are usually made by hand on benches, and is designed to draw a core box 1 to 9 in. deep. Machine is said to be easy to operate, having only two levers to manipulate—an air control valve handle and a vibrator valve lever. Machine is cast of 80 per cent aluminum and weighs 210 lb. In operation the corebox is filled with sand, a plate is placed on top and clamped by movement of the valve handle. After the machine is rolled 180 degrees to the left the vibrator is started and the core drawn. The core then is removed and the machine rolled back to its original position.

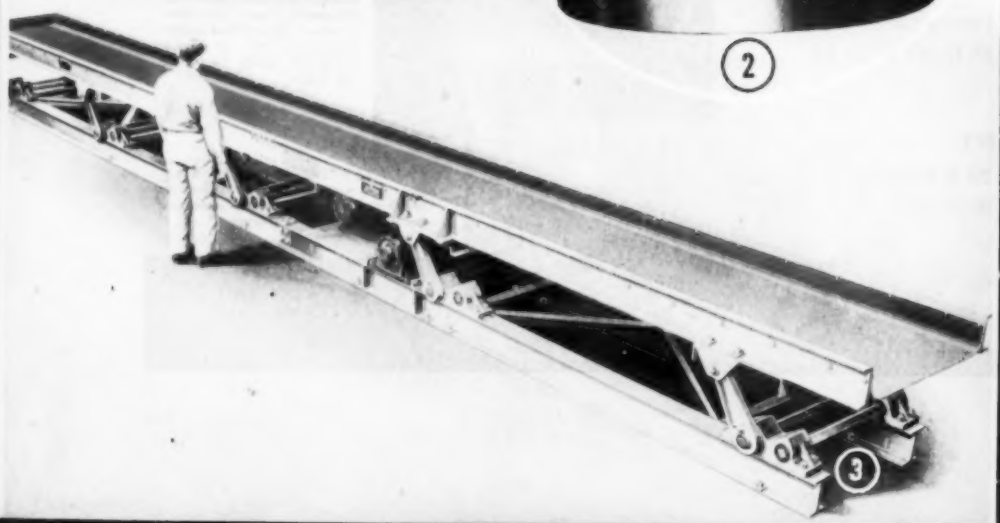


(2)—Lifting Magnet: Cutler-Hammer Inc., 244 North Twelfth St., Milwaukee 1—New capsule-coil construction of the company's lifting magnet incases the coil in an all-metal, welded capsule from which moisture is removed by a vacuum process prior to impregnating the coil with insulating compound under pressure. Thus the coil winding is said to be sealed completely against the entrance of moisture. The capsule coil is designed to be quickly and easily removed if damaged, a replacement coil inserted and the magnet immediately restored to service. This feature is available in the 45, 55 and 65-in. magnets. Pole shoes which can be removed after becoming worn are a feature of this new construction. They are held in place by alloy bolts.

(3)—Oscillating Conveyor: Link-Belt Co., 307 North Michigan Ave., Chicago 1—Conveyor is a positive-action, roller bearing, eccentric type oscillating trough feeder-conveyor, driven by a Link-Belt Electrofluid Drive through a chain or V-belt reduction to the machine's eccentric shaft and connecting rod assembly. It is available in standard trough widths of 12 to 48 in. and in single trough lengths up to 100 ft. For longer carrying runs, two or more units may be arranged in series, one discharging into the other, and each equipped with an individual motor drive. Besides carrying material in a horizontal path, the oscillator also may serve as a cooler, dryer or conditioning unit when jacketed, louvered or otherwise constructed for the service intended. Trough is either pan type or constructed with channel steel sides. The standard trough is said to be leak-proof and can be furnished with dust-tight covers or constructed for air and gas tight movement of the material. Conveyor trough can also be fabricated of corrosion and heat resistant metals.

(4)—Cut-Off Machine: Fox Grinders Inc., Oliver Bldg., Pittsburgh 22—Swing frame cut-off machine, designed to take advantage of the new flexible type cut-off wheels, is adapted to removing sprues and risers from bronze, aluminum and

(*Continued on page* 256)

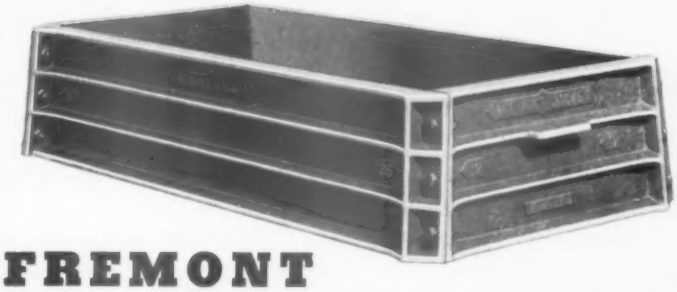


FREMONT

MAGNESIUM FLASKS

ACCURATE-LIGHT-STURDY

All Orders Given Very Prompt Attention



FREMONT CAST IRON JACKETS

BUILT FOR LONG SERVICE AND FAST PRODUCTION

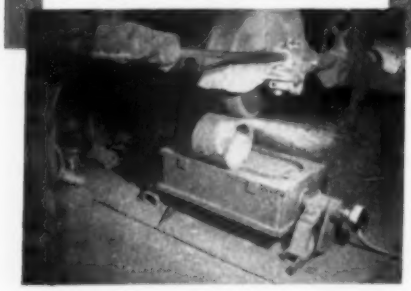
GROOVLOCK

THE FOOL-PROOF PIN

THE FREMONT FLASK CO.

Fremont, Ohio

THERE'S ROOM FOR COST REDUCTION IN SWING GRINDING



DINGS HOLD-TITE ELECTRO-MAGNET

Reduces set-up time . . .
Decreases grinding time . . .
Helps production planning . . .
Increases grinding wheel life

Steel and iron castings of any shape or weight are held securely in position under a swing grinder with Dings Hold-Tite Magnet—eliminating need for blocking, wedging or clamping. Firm hold on piece increases wheel life. Over-all grinding time is reduced 25% or more—with benefits of lower unit labor costs and less operator fatigue. Also makes possible better production planning because grinding times become more standard. Magnet has easily renewable wearing plate. Available with or without trunnions which allow tilting to seven positions by foot lever. Available for 115 or 230 volts D.C. with hand or foot switch. Built in two sizes: magnet face 16" x 29½" or 16" x 16" Write for full details.

Other Features:

- Wound for continuous duty with glass-insulated wire. Long life.
- Low operating cost—only 290 watts for small size—475 watts for large size.
- Simple and sturdy construction . . . easily installed . . . negligible maintenance cost.
- Extra strong magnetic holding power.

DINGS MAGNETIC SEPARATOR CO.
4708 W. McGeogh Avenue, Milwaukee 14, Wis.

Separation Headquarters Since 1899

Dings
"HIGH INTENSITY"

(Continued from page 254)

iron castings. Used with this machine, the wheels operate at a peripheral speed of 15,500 fpm, and it is said that cuts can be made to conform closely to the contour of the casting. The machine is maneuverable through 180 degrees and model #10-C is powered by a 7½-hp totally enclosed fan-cooled ball bearing motor and driven by two #128-B section V-belts. It accommodates wheels 16 x 5/32 x 1 in. and weighs approximately 400 lb.

Hardness Tester: Clark Instrument Inc., 10200 Ford Rd., Dearborn, Mich.—Superficial hardness tester for Rockwell testing is designed for testing surfaces that must not be marred, even by the standard Rockwell indentation. Depth of penetration is held to limits of 0.005 in. or less. Tester is available with 8, 12 or 16 in. vertical capacity. Standard equipment includes specially formed and lapped diamond cone penetrator; steel ball penetrator; telescoping cover and oil reservoir for elevating screw; standard 3½-in. anvil; checking anvil; V anvil; raised V anvil; metal dust cover; leatherette cover for instrument and test blocks.

Sand Cooling: National Engineering Co., 608 Machinery Hall Bldg., Chicago 6—Rotary cooling hood designed for installation on the company's intensive sand mixer is said to provide control of sand temperatures throughout mixing cycles. Basic principle employed in the cooler is the mechanical principle of cooling through evaporation. Excess moisture is added to the sand, and air at high velocity is forced through the sand as it passes over the plows. As the moisture is evaporated, the heat in the sand is transferred to the vapor generated, and carried out of the mixer. A slight vacuum is maintained in the mixer to prevent dust-laden air from escaping into the work

(Continued on page 258)

RADIANT FACINGS *Since 1879*

BILL GAGGER *says:*

They're New!! They're Better!!

RADIANT LIKWIPART

For all metal pattern production work. More and cleaner lifts per application. Fast drying. Leaves a polished finish on the pattern. A little goes a long way.

RED BALL ● LIQUID PARTING

An oily base type liquid parting. Fine for sand slinger and plaster molding work. Stays in perfect solution.

DUXBAK

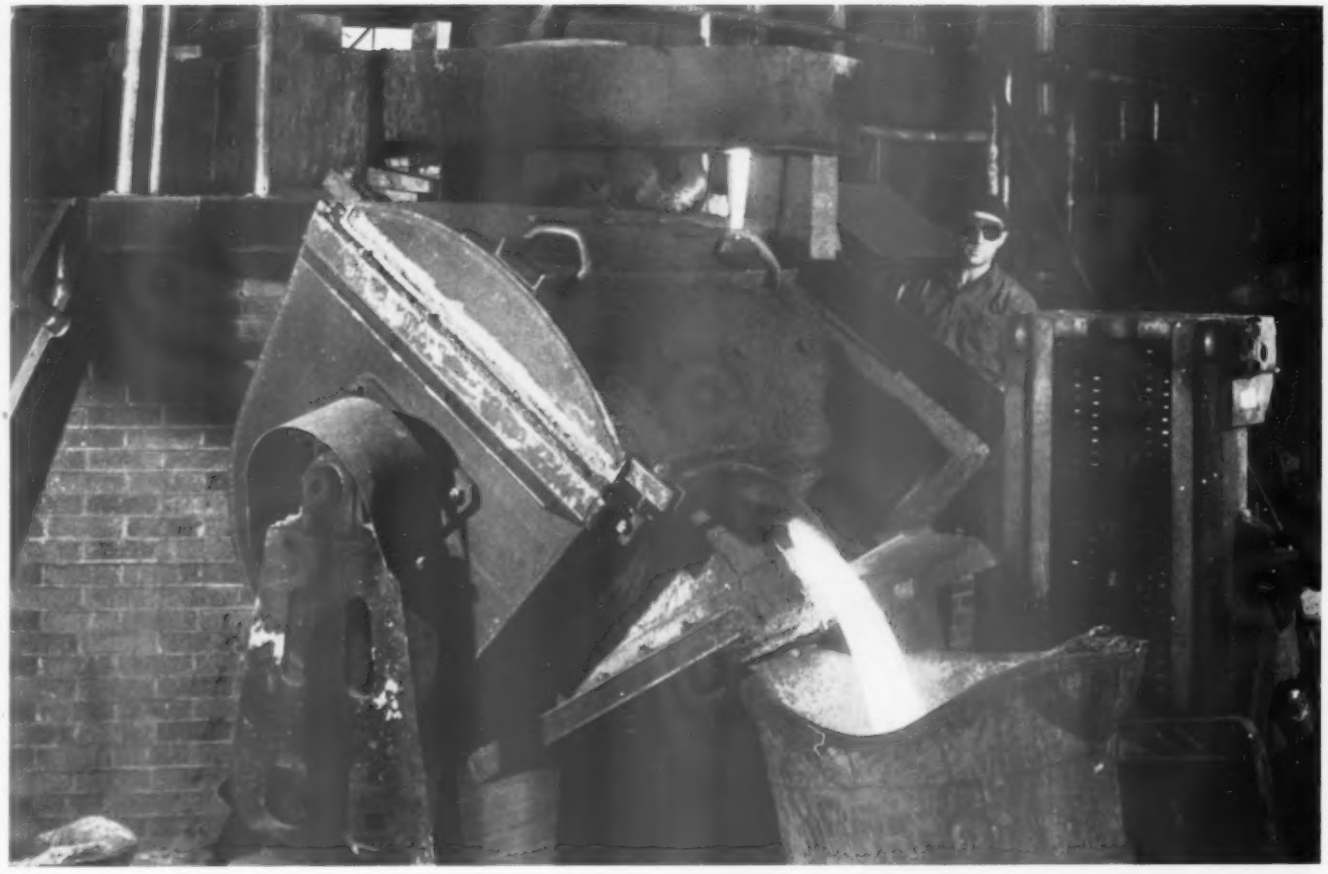
As waterproof as a duck's back, yet swabs easily. Clean lifts and meets all insurance and state industrial requirements.

• • •

Samples of any, or all of these will convince you.

The Smith Facing & Supply Co.
1857 Carter Rd., Cleveland, Ohio

"IRONTON NOJOINT"
for Foundry Ladles



Meadow Lands, Pennsylvania Foundry
American Brake Shoe Company

"Ironton Nojoint", special type plastic ramming refractory is ideal for lining the U-shaped mixing and desulphurizing ladles used in today's most modern foundries. It gives considerably longer service than regular fire brick or special shapes, due to the solid, dense, monolithic lining being so resistant to alkaline slags.

"Ironton Nojoint" is economical to use and is quickly and easily installed. Ask us for complete information on "Ironton Nojoint".

THE IRONTON FIRE BRICK COMPANY
RELIABLE REFRACTORIES
IRONTON OHIO

FOR .... CLEANER METALS .... SOUNDER CASTINGS ... IMPROVED PRODUCTS ..... INCREASED SALES .... SPECIFY—

IMMUNITAS FLUXES

for: BRASS BRONZE ALUMINUM ..... ZINC AND ALL OTHER NON FERROUS AND FERROUS METALS .....

ALSO:

ONCE TRIED— ALWAYS USED!

Die Coatings
Pot and Ladle Coatings
Furnace Cement
Welding Fluxes
Soldering Fluxes
Metal Cleaners
Heat Treating Compounds

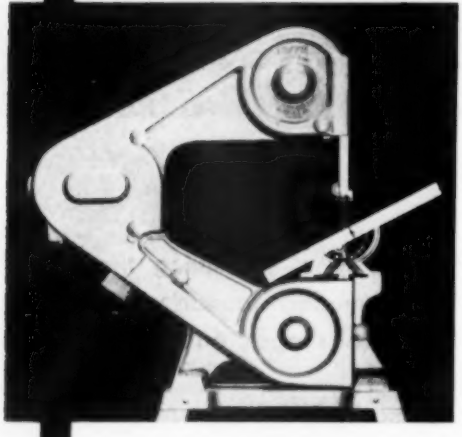
To secure effective fluxing and to bring all impurities to the surface we have developed compound fluxes which do not absorb moisture from the air; they do not smoke or create fumes; your skimmings will be in powdered form with little metal if skimmer is riddled off.

SEND FOR BULLETIN "F"

ATLANTIC CHEMICALS & METALS CO.

1921-27 N. KENMORE AVENUE · CHICAGO 14, ILLINOIS

A RUGGED, COMPACT BAND SAW FOR PRECISION WORK IN FOUNDRY AND PATTERN SHOPS



The OWEN DEEP THROAT BAND SAW

18¼" FROM BLADE TO FRAME

Developing a blade speed of 3,200 feet per minute, the Owen Saw will operate without vibration. Table tilt eliminates reversing layout. Positive table lock prevents creeping with heavy overhang jobs.

FLOOR MODEL, less motor, $335
BENCH MODEL, less motor, $297
MOTOR, ½ HP—1750 RPM—$35.50

CUTS WOOD TO 8" THICKNESS, NON-FERROUS METALS TO 2½" THICKNESS, OR PLASTIC. 30° FRAMESIDE AND 45° OUTSIDE TABLE TILT.

Write For Descriptive Folder!

THE OWEN PATTERN AND FOUNDRY CO.

710 W. 22nd STREET NORFOLK, VIRGINIA

(*Continued from page 256*)

area. It is said that moisture content can be controlled more closely due to the lower temperature of the sand after mixing, resulting in less evaporation and change in the moisture content after it has left the mixer.

Elevator: Bosworth Mfg. Co., 6723 Denison Ave., Cleveland 2—Vertical centrifugal discharge type, spaced bucket elevator measures 6 x 10 in. and is designed to operate at a height of 45 ft by the addition of intermediate sections. It is equipped with welded steel buckets spaced on 10-in. centers on a rubber elevator

belt and has a capacity for handling any free flowing dry bulk material not over 1½ in. lump size at the rate of 25 tons per hour. Unit is electrically powered and utilizes 10-in. diameter pulleys and a floating boot section which acts as an automatic take-up control, keeping the belt taut.

Electrodes: Harnischfeger Corp., Welding Division, 4400 West National Ave., Milwaukee 14—New group of four hard-surfacing electrodes cover the Rockwell C range from 35 to 63 as deposited. Features claimed for the electrodes are an easy, stable arc; no sputtering or hum; smoothly flowing weld metal, and absence of the necessity for cleaning welds as there is no slag to remove.

Oil Burners: Spin-O-Trol Co., 16 Perry St., Buffalo 3—Oil burners for industrial ovens and furnaces are designed to produce even heat distribution. Existing oven or furnace settings are said to be easily converted to the use of these burners which are made to eliminate bridge walls, fire boxes, firing tunnels, fans, stacks

(*Continued on page 260*)

WHAT EVERY PERSON OVER 21

SHOULD KNOW about advertising

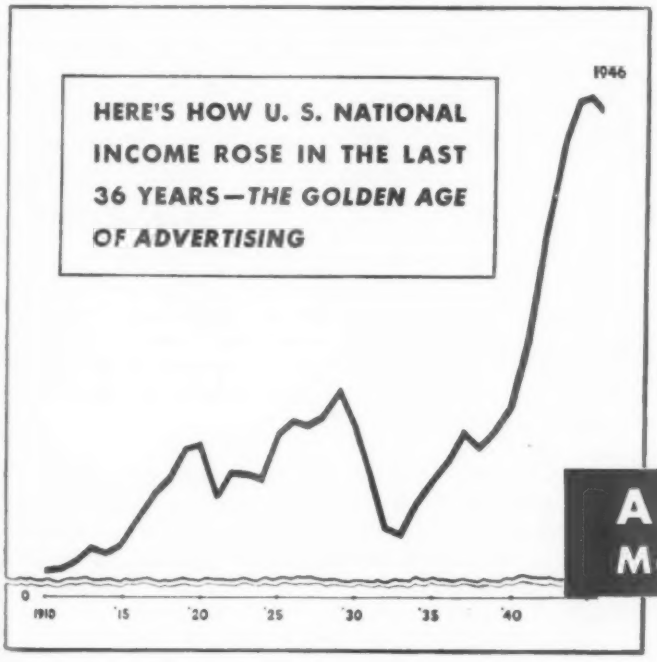
I AM an ad. And everyone who has a job or wants one should know what I do.

For it's advertising—by selling more goods to more people—that makes jobs, and makes jobs *more secure.*

Whether you want a job or want a better one, remember—jobs all along the line depend on somebody selling something to somebody else. And advertising is the lowest cost way yet devised to sell goods.

That's why advertising is called the spark plug of American business. Advertising makes the wheels go around. For advertising's job is to sell. When more goods are sold, there are more jobs and better jobs for everyone. Selling less goods means failures, pay cuts, layoffs.

So whenever you see or hear advertising, don't forget that it's helping you. If it weren't for advertising's low-cost way of selling goods, you couldn't have such a secure job or opportunity in the future.



This rise in the standard of living for you and yours is unequalled in all history. Advertising helped raise this standard—is needed even more today to sell industry's new developments.

OTHER WAYS ADVERTISING HELPS YOU AND YOUR FAMILY

1. Brings you better goods for less money.
2. Makes shopping more pleasant and easier.
3. Gears consumer demand to production, to create prosperity.

Advertising... BY SELLING MORE GOODS TO MORE PEOPLE
Makes your job more secure

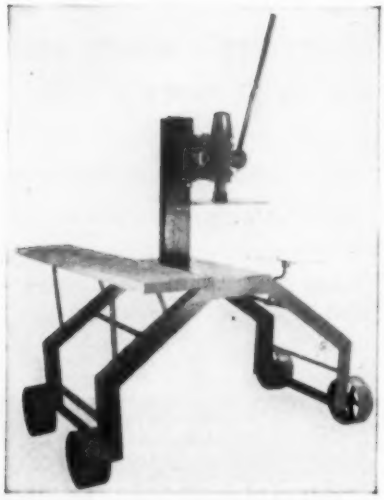
Advertising Federation of America

"RAPID" MOLDING MACHINES

★

PORTABLE JOLT SQUEEZER R9X

WRITE for NEW BULLETIN "F"



PORTABLE HAND SQUEEZER R-10

PIONEER MANUFACTURING CO.

Molding Machine Manufacturer for Over 20 years

MILWAUKEE (West Allis) WISC.

(*Continued from page* 258)

and flues. Burner is said to atomize and gasify thoroughly the fuel, insuring complete combustion, thus avoiding heat loss. Compressed air or steam at 40 psi or higher is used as the atomizing medium. Oil pressure should be not less than 20 psi. The flame is short and compact, burning without contacting adjacent brick work.

Truck Dump Bodies: National Truck Equipment Co., Dept. 484, 225 Madison St., Waukesha, Wis.—Said to be fully automatic, hydraulic-

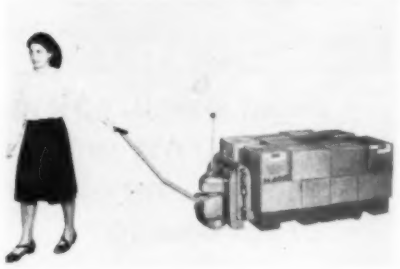
ally operated and cab-controlled, hoist may be mounted on the truck chassis frame, converting a standard pickup truck into a pickup dump truck. Welded steel reinforcement frames are furnished to bolt to the bottom of any standard pickup body, or a welded steel pickup truck express-type box with double-acting tailgate is available. Tailgate swings from the top for dumping as well as from the bottom, and when lowered adds 14-in. to the length of the truck box. Hydraulic hoists are available in a 3-ton capacity twin size for mounting on 3/4 and 1-ton pickups and a 1-ton capacity single size designed for 1/2-ton pickups. Hoist units are available with complete kit of attachments and parts.

V-Belt: United States Rubber Co., 1230 Sixth St., New York 20—Nylon-reinforced V-belt is said to have twice the strength and four times the average life of conventional V-belts. Belt contains a series of tough nylon cords covered with a special synthetic rubber compound said to be capable of withstanding effects of heat and oil. Other features claimed are high tensile strength, good flexibility and a sufficient amount of elasticity to absorb shock.

Fire Extinguishing System: American-LaFrance-Foamite Corp., 10 East LaFrance St., Elmira, N. Y.—New CO_2 fire extinguishing system is designed for protecting Class "B" and "C" risks requiring localized or total flooding and for rotating electric units requiring a sustained discharge of CO_2. After first sounding an alarm to permit employees exit from the fire area, the system is said to automatically shut off power units, close windows and doors when fire strikes. System then discharges CO_2.

Gravity Conveyors: Rapids-Standard Co. Inc., Dept. RR-129, 342 Rapistan Bldg., Grand Rapids 2, Mich.—New models of the company's gravity conveyors are 15 and 24-in. wide and supplement two original sizes, 12 and 18-in. wide. All widths are available in 5 or 10-ft. lengths. Conveyor channel is 3½-in. deep and 1-in. wide and is reinforced with cross angles. Spanner bushing on each roller effects a knitted frame which is said to add further strength to the conveyor. Conveyor rollers, 2 in. diameter, are formed of 16 gage steel, have die formed ends to prevent damage to products handled.

Hand Lift Truck: Service Caster & Truck Corp., 691 North Brownswood, Albion, Mich.—Hand lift truck for double faced pallet handling features a set of rollers that float the truck frame over the bottom face of the pallet so gently that an empty pallet is said not to be displaced from position by inserting the truck. Short stroke, vertical pump handle actuates hydraulic lifting mechanism. Hydraulic safety valve prevents overloading, and a hand-operated release valve permits controlled lowering

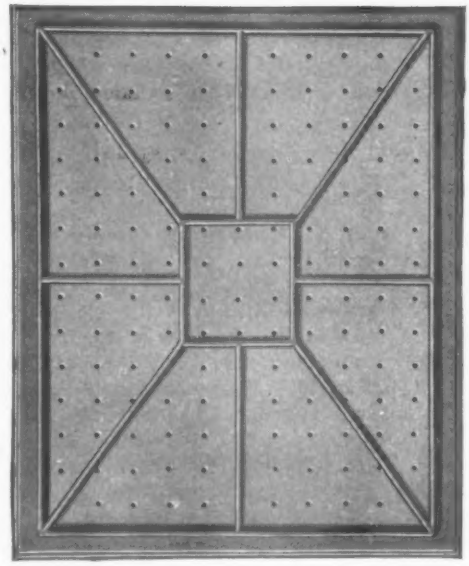


speed. Truck is available only in 4000-lb capacity. Lowered height is 3¼ in., lift is 4 in. and overall height is 27 in. Fork lengths are 36, 42, 48, 54 or 60 in.

Concrete Breaker: Gardner-Denver Co., P. O. Box 1020, Quincy, Ill.—Medium weight concrete breaker is designed for general demolition work and is suitable for horizontal operations such as tearing out walls, trenching in shale or hardpan, or for preparing black-top for patching. It has a safety latch on the throttle valve handle to prevent accidental operation of the hammer when moving the breaker about on the job

(*Continued on page* 262)

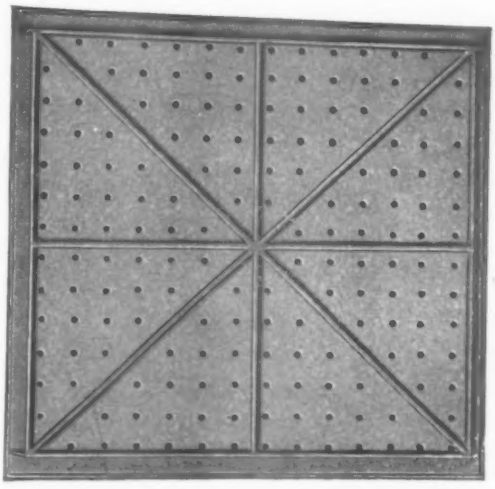
DIAMOND CUSTOM-BUILT
CORE PLATES



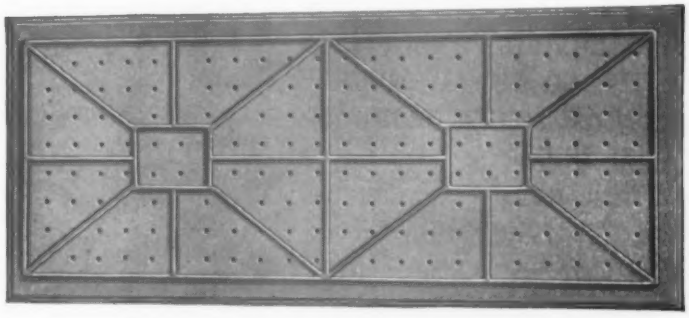
STYLE CP-3—This type reinforcing on "square" plates for loads up to 1200 lbs. Typical sizes run 40" x 50" and 36" x 60".

CARRY CORES UP TO 1200 LBS. WITHOUT DEFLECTION!

Less baking time with Diamond Plates . . . because sturdy construction with light weight is achieved. They heat up and cool more quickly. Fabricated from ½" or heavier plate as indicated to meet load requirements, users acclaim the long-life and uniform quality of Diamond Plates. Available in special and standard sizes to suit your exact requirements.



STYLE CP-1—This construction used on plates in the 30" x 30" range for core loads up to 200 lbs.



STYLE CP-2—For long and narrow cores and loads to the 1200 lb. range. Note web-bracing construction.

HOW TO ORDER DIAMOND CORE PLATES

Since we recommend "job fitted" plates for real production efficiency, we suggest your telling us *how heavy your core loads will be* and the *approximate overall plate* size. We will design reinforcing accordingly, and quote in terms of plates best suited to your needs.

DIAMOND

Telephone 2553 CLAMP AND FLASK COMPANY Richmond, Indiana

Designers of CORE PLATES, JACKETS, BANDS, FLASKS *since 1889*

13

IS NOT UNLUCKY

when it means 13 ways of saving money!

Foundries Materials Co. offers 13 different, useful products that you can put to work in your foundry . . . and each one is designed to cut costs. Here are the 13 products:

- **AKRO COMPOUND**
- **NATIONAL FOUNDRY BENTONITE**
- **FMC—ALUMINUM BOTTOM BOARDS AND CORE PLATES**
- **ALLBOND CEREAL BINDER**
- **KORWELD CORE PASTE**
- **FIRE BRICK**
- **FIRE CLAY**
- **SCIOTO FIRESTONE**
- **MILL STARS**
- **CORE & MOLDING SANDS**
- **SEACOAL**
- **SHOT AND GRIT**
- **SILICA SANDS**

and:

ALUMINUM BOTTOM BOARDS

FMC aluminum bottom boards have been engineered to take rough handling. Adequately reinforced by sturdy ribbing, they have proven their ability to withstand normal foundry usage. Perforations are provided in the plate assuring ventilation of the mold, yet are so installed that the strength of the plate is unimpaired. Aluminum bottom boards will pay for themselves in a few weeks.

Just-a-minute delivery by fast trucks or plane. FMC means FOUNDRIES MATERIALS CO. See FMC. Buy FMC. Call or write today.

FOUNDRIES MATERIALS CO.
Coldwater, Michigan
Phone 564
Detroit Office: 5735 Cass Ave. Phone: Madison-8921

(*Continued from page* 260)

with live air on the line. It is equipped with a lubricator of sufficient oil capacity for several hours' operation. It weighs 63 lb, has overall length of 23 in. and can be fitted with chucks for either 1⅛ or 1¼-in. hexagon tools.

Hoist: Shaw-Box Crane & Hoist Division, Manning, Maxwell & Moore Inc., 414 Broadway, Muskegon, Mich.—Lever-operated hoist is designed to accomplish lifting by having the lever act on a gear train exactly the same

as in hand or electrically operated hoists. Hoist is equipped with antifriction bearings and a Weston type load brake located between the operating lever and the lifting pocket wheel. Operating handle is 12 in. long and requires a pull of 40 lb to lift a load of 2000 lb. Hoist with capacity of 1 ton weighs 14½ lb, and the 2-ton capacity unit weighs 18¾ lb.

Indicator Calipers: Woodworth Specialties Corp., 58 Wall St., Binghamton, N. Y.—Calipers have hollow legs, one of which encloses a spring actuated hand. The pointer end of the hand comes to the outside through a slot in the leg and sweeps across the indicator marks when pressure is applied to the opposite end of the hand. Pointer moves about 20,000ths in. for every 1000th of the contacting point. A variation of a fraction of a 1000th is said to be readily noticeable. Calipers are made of stainless steel in inside and outside models.

Carbon Additive: Exothermic Alloys Sales & Service Inc., 301 East 138th St., Chicago 27—Exothermic carbon material is designed to add carbon to gray iron in amounts hitherto considered impossible. In addition to raising the carbon content in gray iron, this material is said to increase fluidity, decrease sulphur content and reduce the chill. Being exothermic, it can be added in any quantity to an iron ladle without reducing temperature of the iron. In large additions it increases the temperature, it is claimed.

Refractory: Titanium Alloy Mfg. Co., Hyde Park Blvd. & Lafayette Ave., Niagara Falls, N. Y.—Company has developed a new material known as stabilized zirconia, which is said to have an unusually high melting point and to possess good heat shock resistance.

Lift Truck: Market Forge Co., 25 Garvey St., Everett 49, Mass.—Rider-controlled electric lift truck may be handled in three ways by the operator: For short hauls he may ride on a folding step, and for longer hauls he may ride on a swivel seat, facing the load or facing away from the load. Truck is available in a 3000-lb capacity model with average speed of 3.5 mph or a 5000-lb capacity model which travels at 3 mph. Twenty per cent overload capacity is guaranteed. Brake goes on when the operator removes his foot from the speed control pedal. It is available with platform lengths from 36 to 72 in. Units are 26-in. wide with lowered platform heights of 6, 7, 9 and 11 in. Lift is 4 in. and is accomplished by motor operated hydraulic pump and simple ram. Truck

is equipped with cushion rubber wheels and uses a 340 amp-hr battery.

Impact Hammer: Bryant Products Distributing Co., 297 West Michigan Ave., Jackson, Mich.—Bench-type production hammer produces 1 oz to 12,000 lb impact with 100 psi line pressure. The stroke is constant, and impact pressure may be varied up to the press capacity, remaining the same at any point along the stroke, it is claimed. Hammer may be connected to any ¼-in. pipe connection. Speed of operation by hand or foot control is approximately 60 strokes per minute. Fully

(*Continued on page* 264)

Wherever steel is made...

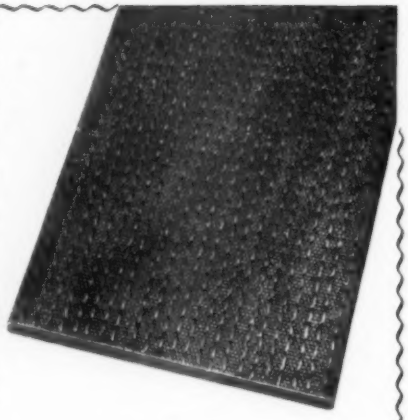
PHILO BRAND — DEPENDABILITY • QUALITY • SERVICE

RAINIER BRAND — DEPENDABILITY • QUALITY • SERVICE

Detroit area producers are contributing greatly to the steel industry's billion-dollar expansion program.

Ohio Ferro-Alloys Corporation
Canton, Ohio

Chicago Detroit Pittsburgh San Francisco Tacoma



Sahara Heat-Resisting Belting

Wears Longer!

For almost 40 years, foundries have been using Sahara Belting because it is unexcelled for conveying and elevating hot materials.

STANDARD SAHARA is for handling materials up to 300° F. INSULATED SAHARA, combining asbestos and special insulating material with the cotton base, is for use where sustained temperature of materials is from 300° F. to 450° F.

The effective heat-resisting qualities of Sahara Belting is due to special impregnation and insulation. The base of both Standard Sahara and Insulated Sahara is a 37½ ounce, tight-woven duck having a tensile strength exceeding 700 lb. per inch of width. Our double-stitched and Inner-Locked construction is employed to permanently prevent ply separation.

Write for our new folder 47-8 on Sahara Heat-Resisting Belting.

Imperial INNER-LOCKED BELTING

Imperial Belting Co.

1755 S. Kilbourn Ave. • Chicago 23, Ill.

Engineered Belting—
The Right Belt for Each Job

(*Continued from page 262*)

automatic operation is accomplished with a solenoid valve and guide rod switches. Bench height of the hammer is 27 in., area 6½ x 11 in., stroke 3 in., 3¼ in. ram to column and 10 in. between ram and base with 26-in. column.

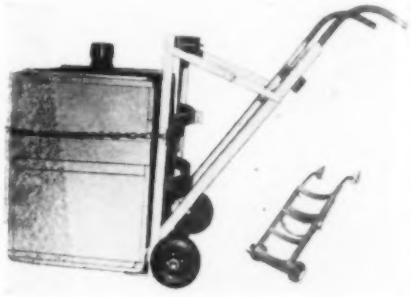
Electric Cord Reels. Benjamin Reel Products Inc., 10700 Broadway, Cleveland 5—Reels take up excess cord and pay it out as required. They are available in a number of models for different installations and are equipped with various gages of wire. Models for overhead installations are painted gray and are equipped with rubber covered cord and bracket, which permits reel to swivel approximately 180 degrees and rock approximately 90 degrees.

Air Velocity Meter: Illinois Testing Laboratories Inc., 420 North LaSalle St., Chicago 10—Portable,

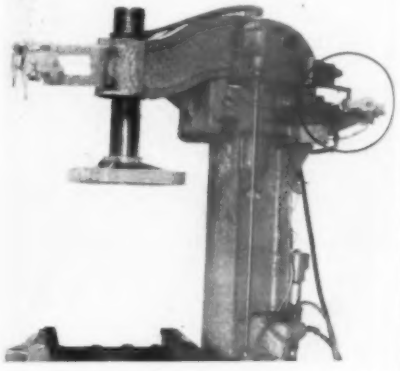
direct reading instrument is designed to provide instantaneous and precise measurement of air velocities in unrestricted areas. Completely self-contained, the instrument is 4 in. high, 3 in. wide, 1½ in. deep, weighs 8 oz, has single or double velocity range scales and requires no jet attachments. It is calibrated to provide direct reading of air velocity in feet per minute or miles per hour without timing, calculations or reference to tables and charts.

Transformers: Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14—Dry type class B insulated load center transformers for plant power distribution circuits are available in three-phase, 60 c, 100 to 2000 kva, with high voltages of 2400, 4160, 4800, 7200, 12,000, 13,200 or 14,400, and low voltages of 600, 480, 240 or 208Y/120. All are rated 80° C rise, with natural ventilation. Transformers are housed in paneled enclosures designed for indoor installation. Matching compartments for primary and secondary switchgear can be furnished.

Hand Truck: General Scientific Equipment Co., 27th and Huntingdon St., Philadelphia 32—Lightweight hand truck has two carrying positions which adapt it to a variety of portage jobs. In the open position the truck can be used to move carboys, acetylene tanks, barrels, packages and other items in a vertical position to avoid spilling the contents. In the closed position the truck can be used as a hand truck to transport boxes, barrels and similar items in the conventional manner. Designed to give maximum leverage on the handles and to carry the load on the wheels, the truck is available with acid-resistant wheels or rubber tires. A chain is provided to hold items being transported.



Arm Operator: Schoelkopf Mfg. Co., 312 North Third St., Madison 4, Wis.—Company's door operator has been adapted to the foundry field as shown here (in the circle) mounted on a large jolt squeeze molding machine. It swings a 2000-lb arm through an angle of 90 to 120 degrees at the touch of a button.



Unit swings the arm into position for squeezing and then out of the molder's way when the squeezing operation is completed. Action is said to be fast and smooth.

Solder: Alpha Metals Inc., 363 Hudson Ave., Brooklyn 1, N. Y.—Newly developed acid core solder is said to have the following advantages: Ability to solder stainless steel, monel and nickel; it has three cores instead of one; the synthetic acid used is more active as a flux than zinc chloride, yet only half as corrosive, and is easily washed off with water. It is packaged in 1, 5 and 20-lb spools.

Oven Furnace: Sunbeam-Stewart Industrial Furnace Division, Sunbeam Corp., 4433 Ogden Ave., Chicago 23—Small, semi-muffled gas fired oven furnace with temperature range of 300 to 2400° F has new type burners permitting a 95 per cent turndown range of fuel. Uniformity at low temperatures is obtained by increasing air over gas ratio—thus heating by convection. Staggered position of nozzle-mixing, wide-range burners results in a circular turbulence throughout the heating chamber, it is claimed. Furnace is adaptable to various types of standard temperature control and may be used for annealing, carburizing, hardening, preheating, tempering and general heat treating. It comes in the following sizes: 4 x 8 x 12-in.; 6 x 12 x 18-in., and 9 x 15 x 24-in. heating space.

Water Cooler: Ebco Mfg. Co., 401 West Town St., Columbus, O.—Electric drinking water cooler is designed for maximum protection against rust from condensation of high-humidity air, corrosion from fumes and mechanical damage from lint and dust. These features of the pressure type cooler are attained by having the water cooled condensing unit and other vital mechanical parts sealed in an air-tight pressurized cabinet. It has a storage capacity of 10 pints of cooled water and a cooling capacity of 10 gph. Rust and corrosion-proof cabinet requires floor space of 15¼ x 15½ in. Unit operates on 110 v, 50-60 c, single phase ac.

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MAKE YOUR OWN MATCH PLATES IN YOUR OWN FOUNDRY!

Why waste time sending your work outside? TAMASTONE will solve your problem without lost time! You pour TAMASTONE in a sand mold, made by your own molder. No special accelerators, retarders, special vehicles or special experience required. TAMASTONE, the perfect pattern compound mixes with water only. And, TAMASTONE patterns are ready to put into production the following day. Economical too, average 12 x 16 match plate costs only $12 including material molding and cleaning time. Foundries everywhere report 400% to 600% increase in production!

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★ *REINFORCED* FOR HEAVY-DUTY SERVICE!

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...TRADE PUBLICATIONS...

INVENTORY CONTROL: Remington Rand Inc., Methods Research Dept., 315 Fourth Ave., New York 10—Booklet pictures and describes modern methods of simplifying the management of stocks to prevent losses either from too much or too little. It shows why and how improved, modern inventory records reduce clerical costs and conserve executive time.

OVENS: Gehnrich & Gehnrich Inc., 3232 57th St., Woodside, L. I., N. Y., — Illustrated manual discusses the four basically different types of oven heating systems; heating media; temperature and safety control; insulation; the material handling problem; the action of different products under heat (chemically, physically, metallurgically, structurally); and the seven basic oven and heater types.

USES OF LEAD: Knapp Mills Inc., 121 Broad St., New York 4—Booklet deals with current developments and improvements in the employment of lead-lined . products, chemical apparatus, and in lead construction, compared with past practices. It is a section of the treatise "History and Origins of Metallic Lead Products" by Alfred P. Knapp.

VACUUM FURNACES: National Research Corp., 70 Memorial Dr., Cambridge 42, Mass.—Brochure on high vacuum furnaces outlines equipment for metallurgical operations in the micron pressure range. Company furnishes melting furnaces which are said to operate successfully at pressures as low as 0.0001 mm Hg absolute.

FLAME CONTROL: Wheelco Instruments Co., 847 West Harrison St., Chicago 7—Bulletin F1-1 contains illustrations, wiring diagrams and a complete description of the company's combustion safeguard systems. Listings of instrument models with recommendations for application and sensing units for gas and oil operation are included.

DENSIFIED WOOD: Bakelite Corp., 300 Madison Ave., New York 17—Booklet enumerates uses of this product by industry for such things as molds and dies and extrusion turntables. Properties of densified wood listed include strength, toughness, and resistance to water, chemical, abrasion, and temperature extremes.

VIBRATION CONTROL: Korfund Co., 48-14 32nd Pl., Long Island City 1, N. Y.—Bulletin Vc-500 describes the use of Armstrong Vibracork for vibration control. Drawings of application methods developed to isolate machines under different installation conditions and specifications are included.

SPIRAL CONVEYOR: Jeffrey Mfg. Co., 907 North Fourth St., Columbus 16, O.—Catalog 803 lists the company's complete line of spiral conveyor and fittings. Selection tables list the various classes of material which can be handled and indicate the proper type of conveyor to use. Capacity tables show the proper size conveyor to use to obtain the capacity desired, and a horsepower formula is included to assist in calculating the power required.

RADIANT HEAT: Westinghouse Electric Corp., Advertising and Sales Dept., Lamp Division, Bloomfield, N. J.—Radiant heat processing for various industries is described in booklet A-3817. Its advantages and types of installations are discussed. Application data to aid in planning installations is included.

CONVEYORS: Hapman Conveyors Inc., 2405 West McNichols Rd., Detroit 21—Catalog 4748 deals with pipe conveyors and accessories. Included are engineering drawings of typical systems. Pictures, sketches and capacity charts illustrate adaptability and performance of the pipe conveyors.

POLISHING WHEELS: Divine Bros. Co., 200 Seward Ave., Utica 1, N. Y.—Bulletin 483-SSDW-1 covers sheepskin discs and wheels and provides specification data, recommended uses, and the various forms available for polishers' use. The different qualities of sheepskin are discussed.

TEMPERATURE REGULATOR: Manning, Maxwell & Moore Inc., 11 Elias St., Bridgeport 2, Conn.—Bulletin describes a snap action temperature limiting regulator for use on processing machinery where a positive shut-off is required when the critical temperature has been reached.

CHAIN DRIVES: Link-Belt Co., 307 North Michigan Ave., Chicago 1—Book 2125, covering silent chain drives, tabulates in easy-to-use selection tables complete stock drives in sizes from ½ to 50 hp. Book also describes taper-lock bushings and steel pinions with hardened teeth.

OILS: Welding Equipment & Supply Co., 223 Leib St., Detroit 7—Literature contains technical data on the following formulated oils: Graphited soluble oil, graphited cutting oil, cutting oil, graphited spindle oil, graphited conveyor lubricants and graphited conveyor grease.

GAS GENERATOR: Ipsen Industries Inc., 311 Blackhawk Bldg., Rockford, Ill.—Leaflet decsribes company's endothermic gas generator for use in bright annealing, copper brazing, sintering, carbon restoration, bright hardening, gas carburizing and gas cyaniding.

FLEXIBLE COUPLINGS: American Flexible Couplings Co., Division of J. A. Zurn Mfg. Co., 1801 Pittsburg Ave., Erie, Pa., Dept. C-1—Booklet describes functions of flexi-

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Simple, efficient, compact, dependable.

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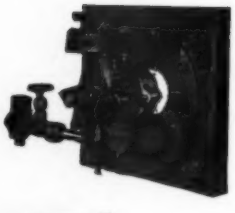
OIL and GAS. "REVERSE BLAST
Mixes ALL the fuel with ALL the air.



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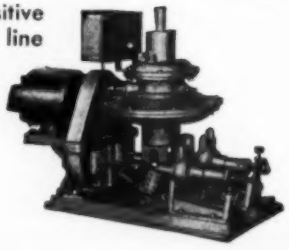

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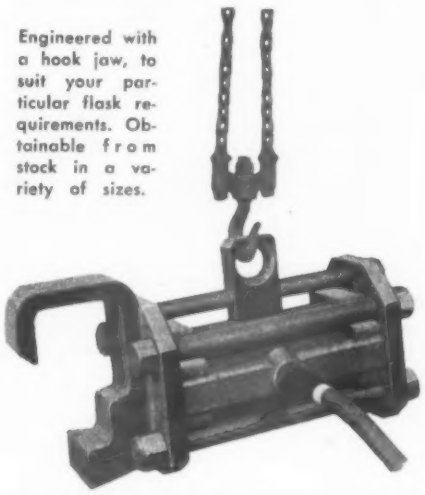

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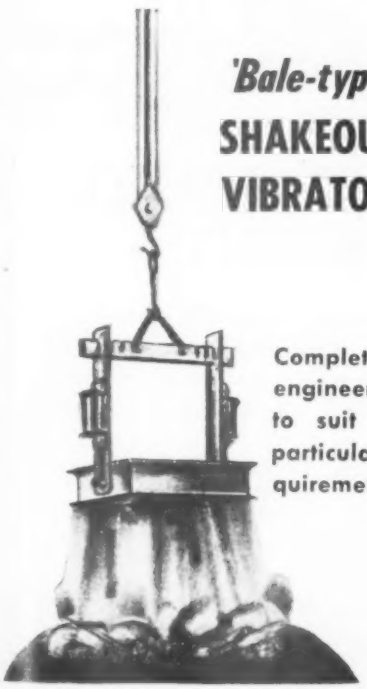


Completely engineered to suit your particular requirements.

ble couplings and explains the principles by which couplings operate. It contains practical helps to design engineers, plant engineers, master mechanics and maintenance men on how the use of proper flexible couplings prevents downtime caused by bearing failure, shaft failure and damaged equipment.

TRANSFORMERS: Allis-Chalmers Mfg. Co., 1126 South 70th St., Milwaukee 1 — Bulletin 11B6935 describes construction details of three transformer types—oil-filled, "Chlorextol" liquid-filled and dry-type. It also covers multicircuit unit substations and their economy, safety and adaptability features as well as construction highlights of the load ratio equipment and the metal clad switchgear.

AIR MOTORS: Bellows Co., 222 West Market St., Akron 9, O.—Bulletin BM 20 shows various types of air motors available in the four power rated sizes and illustrates mountings which are said to meet practically every mounting requirement. Air motor accessories also are shown.

BONDING CLAYS: Eastern Clay Products Inc., Jackson, O.—Illustrated booklet describes the company's new and mechanized clay plant at Bondclay, O. It tells the story of bonding clay production from procurement to packing.

MOTORS: Burke Electric Co., 273 West Twelfth St., Erie, Pa.—Bulletin NAF-1 describes totally enclosed fan-cooled squirrel cage induction motors of 250 to 500 hp. Cross-sectional view of one of the motors and a table of standard ratings are included.

ALLOYS: Vanadium Corp. of America, 420 Lexington Ave., New York 17— Booklet lists the company's alloys, metals and chemicals, giving a brief description of the uses of each of its products and a listing of the compositions.

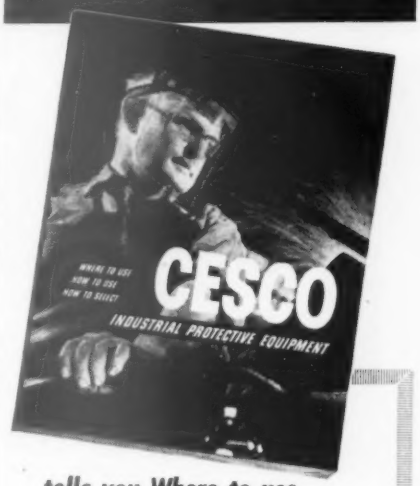
DUST COLLECTOR: Pulverizing Machinery Co., 205 Chatham Rd., Summit, N. J.—Bulletin describes in detail through text and illustrations the company's dust collector, which is designed to handle dry or damp dust.

ROOF VENTILATOR: Powermatic Ventilator Co., 4019 Prospect Ave., Cleveland 3—Booklet describes power-operated roof ventilator and contains tables of specifications. Several views of typical industrial installations are shown.

WELD CLEANING: Industrial Products Co., 2820 North Fourth St., Philadelphia 33—Leaflet describes weld cleaning hammers made of drop forged alloy steel with hardened and tempered chisel heads.

LINE PAINTER: Industrial Tools & Products Corp., 614 Jefferson Ave., Rochester 11—Leaflet describes a liner for painting industrial traffic lines from 3 to 8-in. wide on any type surface.

NEW
CESCO
CATALOG



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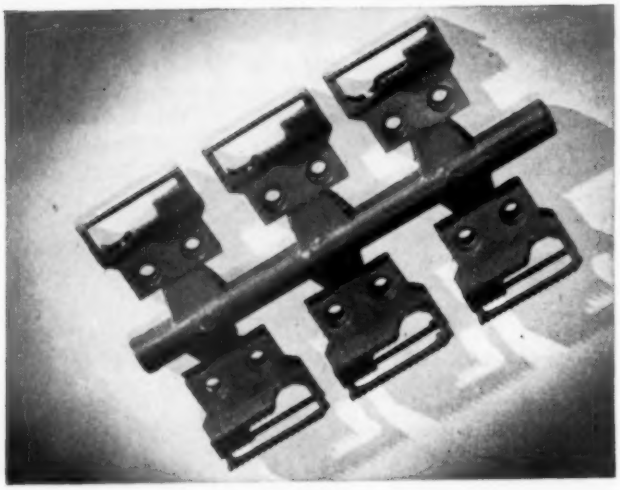

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Here's a good example of the high precision that can be obtained by using ZYROX Pattern Waxes for "Lost Wax" casting patterns. These small sewing machine parts have close tolerances, a satin-textured surface, and need no finishing other than cutting away the sprue.

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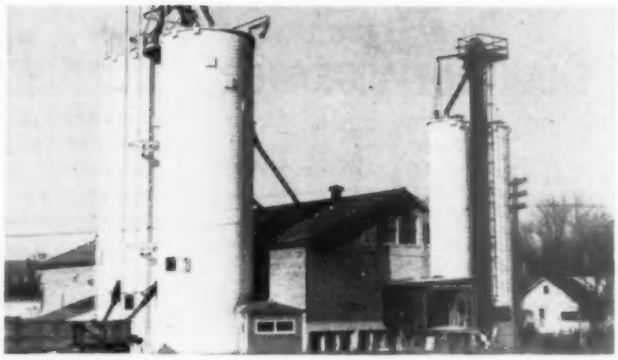

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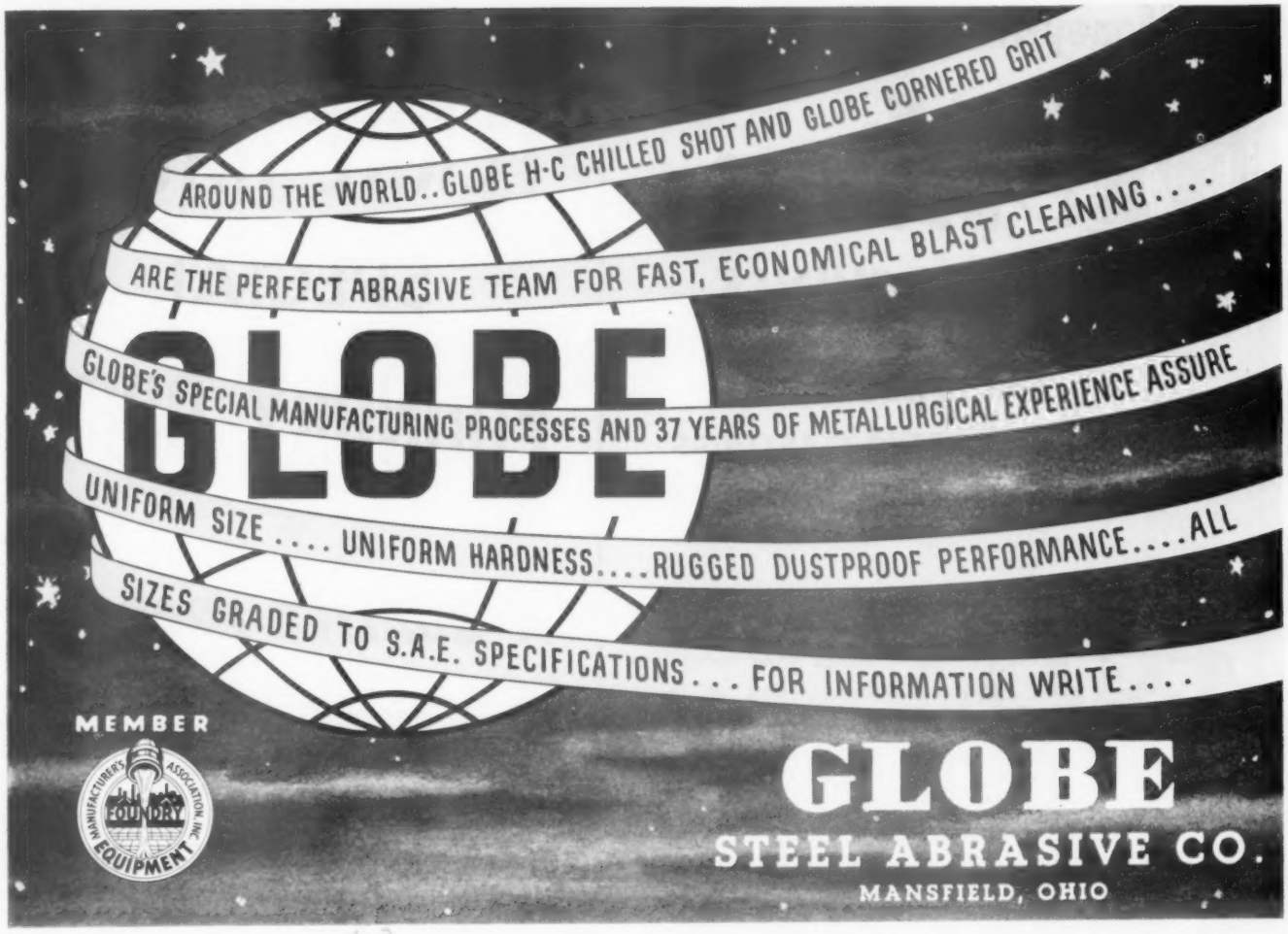
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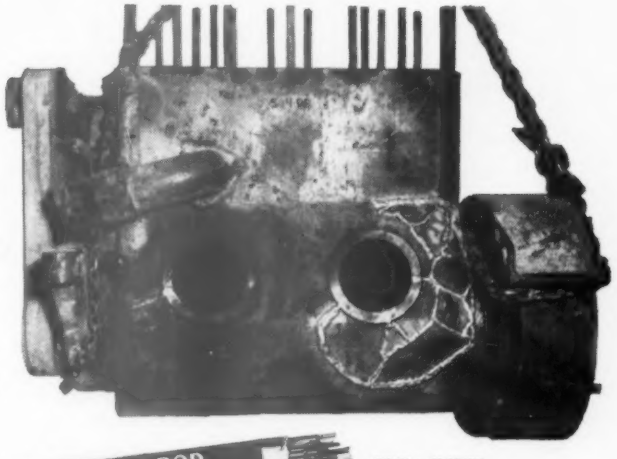

It looked like "curtains" for this cylinder block of a much-needed tractor motor.

Many shops might have scrapped it rather than have attempted to make repairs.

But this shop knew about Ni-Rod.*

They fitted the fractured parts together carefully. Then, with 1/8" Ni-Rod electrodes, they welded them securely in place.

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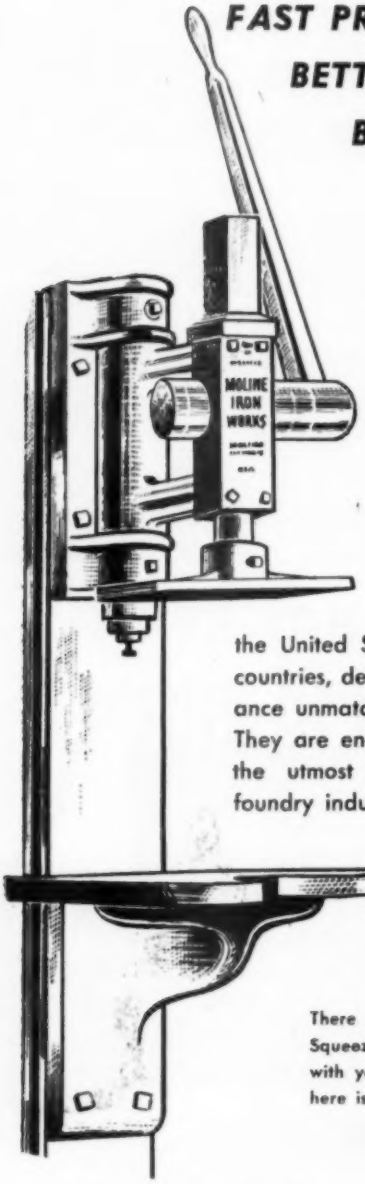

Moline Squeezers have a reputation for getting things done faster and better, and at lower cost. That is why they are being used in all types of foundries from coast to coast in batteries of from half a dozen machines to one hundred and sixty six. They are doing a big job in foundries all over the United States and in nine foreign countries, delivering a level of performance unmatched by similar equipment. They are engineered and built to give the utmost satisfaction to the vast foundry industry.

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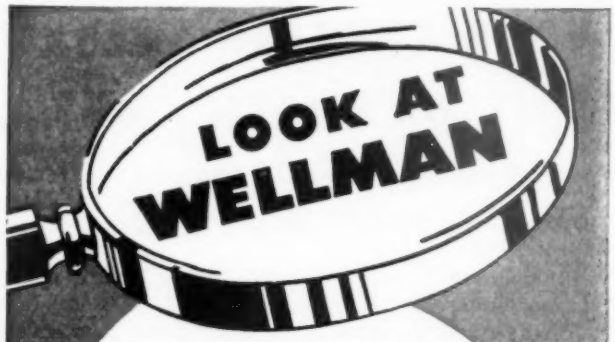

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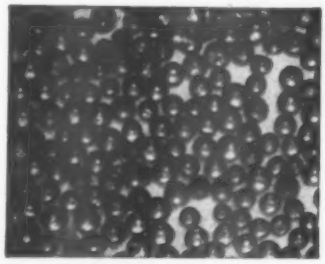
- TOUGH
- DURABLE



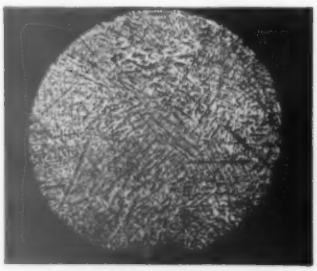
UNRETOUCHED PHOTO OF HI-GRADE SHOT

CLAYTON-SHERMAN ABRASIVES COMPANY

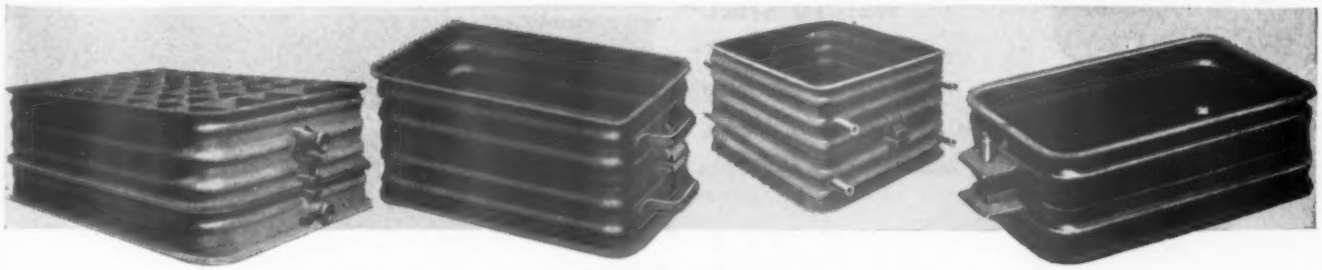
3896 LONYO ROAD

DETROIT 10, MICHIGAN

CEdar 7200



MICROSCOPIC STRUCTURE OF METAL



WIDE RANGE OF HANDLES AND PIN LUGS

Assure Efficient Truscon Steel Flask Performance

The needs of your particular operations can be met efficiently by Truscon welded end handles, welded corner handles and welded handle sockets for two man handling. Straight trunnions and heavy split trunnions are available for mechanical handling. • Truscon Pin Lugs are available as follows: Single or double-bearing welded combination handle and pin lug for use on one-man flasks. Single or double welded type pin lugs, and double face welded type dowel pin lugs, for use on one or two man flasks. • Ask an experienced Truscon Steel Flask man to help you make the *best* choice. • Write for illustrated catalog on Truscon Steel Flasks.

TRUSCON STEEL COMPANY

PRESSED STEEL DIVISION • 6100 TRUSCON AVENUE • CLEVELAND 4, OHIO

SUBSIDIARY OF REPUBLIC STEEL CORPORATION

LADLES

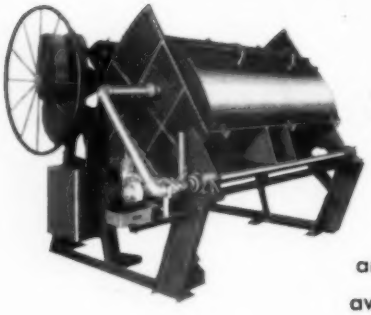
ALL CAPACITIES
ALL TYPES
Including

Timken worm geared Ladles with *Industrial's* patented distortion-proof, self-locking design

BOWLS

PRESSED STEEL
WELDED STEEL
RIVETED STEEL
Including

flat bottom, round bottom, and teapot spout types



SPECIAL EQUIPMENT

Special geared motor driven mixing ladle, an example of custom-build pouring and handling equipment available at INDUSTRIAL

SHANKS, TONGS, BAILS and CUPOLA EQUIPMENT in ALL TYPES

Industrial
EQUIPMENT COMPANY
115 N. OHIO ST. MINSTER 2, OHIO

LATEST CATALOG AVAILABLE

BLACKEN MOLDS
FASTER AND BETTER
with the
MURPHY PISTOL SPRAYER
ELIMINATES SWAB, BRUSH and SPRAY CAN

BLACKENING REACHES HIDDEN POCKETS
MOLDS ARE BLACKENED FASTER
CASTINGS PEEL BETTER
WORK COMES CLEANER
Satisfactory Performance Guaranteed or Money Back

PRICES COMPLETE WITH SUCTION HOSE AND SINKER

PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
PRICE F. O. B. HAMILTON, O.	$12.00	$12.00	$12.00	$14.50	$18.00

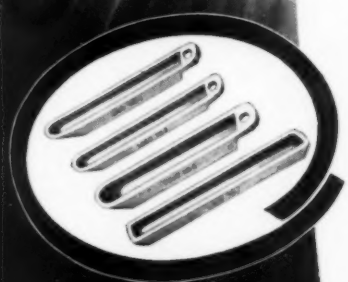
Used for Silica wash, oil, water or any liquid material. For sand-blast cleaning. As a blow gun for cleaning motors and machinery. If your dealer cannot supply you at once, order direct from manufacturer below. Literature on request.

GUARANTEED COMPRESSED AIR PRODUCTS

AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS

JAS. A. MURPHY & CO.
FIFTH AND VINE STREETS, HAMILTON, OHIO
Moisture Elimination Up To 3000 Pounds Per Square Inch

The trend is toward
HIGHER COMBUSTION TEMPERATURES



LECO COMBUSTION BOATS

have been designed to withstand temperatures up to 2700° Fahrenheit.

In addition they give you these features:

- Fast preheating because of light weight.
- Resist heat shock to permit reuse of the boat for repeated combustions.
- Sulphur free.
- Carbon free, except as contaminated from handling.
- ***VERY LOW COST***

There is a Leco Combustion Boat to suit your every requirement. Large stocks of standard shapes and sizes are maintained to assure immediate delivery. Special shapes may be furnished upon request.

Compare the Leco boat with any other on the market. We will furnish you free samples for this purpose.

LABORATORY EQUIPMENT CORPORATION
BENTON HARBOR, MICHIGAN

SPECIFY "CERTIFIED" ABRASIVES

For . . .

● GREATER ECONOMY...

"Certified" Steel Samson Shot and Angular Grit are outstandingly different because each grain is one solid homogeneous mass, *devoid of cleavage lines.* "Certified" Abrasives wear away slowly, retaining their cutting and cleaning qualities to give you maximum blast cleaning efficiency at minimum cost.

● FASTER CLEANING...LONGER WEAR...

"Certified" Abrasives clean faster . . . better . . . wear longer . . . are uniform in size. They're extra tough because of their exclusive automatically-controlled hardening process. *They never break apart.*

● DUSTLESS SAFETY...

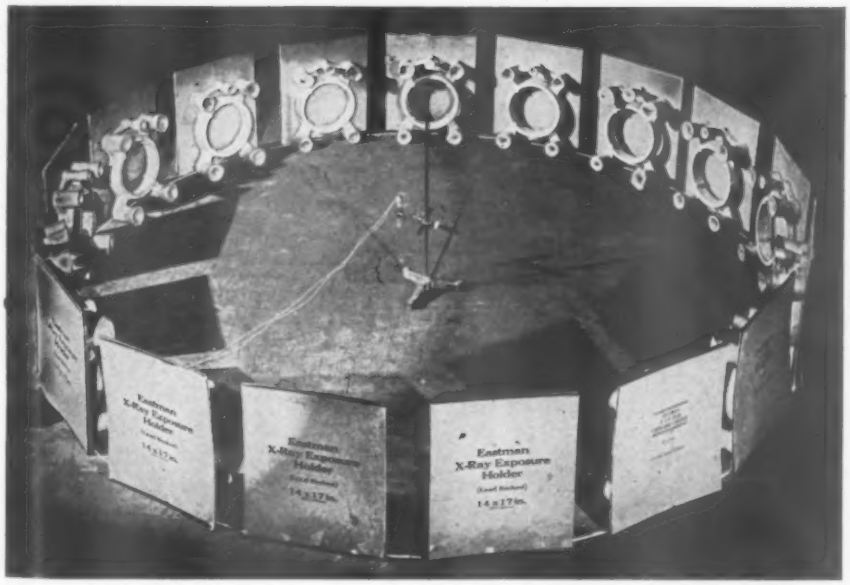
With "Certified" Abrasives you'll never get dust to hinder your production . . . they're safe for all types of blast cleaning . . . they're easily cleaned for re-use. All sizes graded to S.A.E. specifications.

SPECIFY "CERTIFIED" FROM

PITTSBURGH CRUSHED STEEL CO.
PITTSBURGH, PENNA.

STEEL SHOT AND GRIT CO.
BOSTON, MASS.

RADIUM RADIOGRAPHY *Performs a* NEW FUNCTION



PHOTOGRAPH COURTESY OF CRANE CO.

Write us concerning any problem of Gamma Ray Radiography

"Directional solidification" can easily be studied by the set-up illustrated in the photograph—to indicate the best method of casting with a minimum of defects in the casting itself.

Radium has become a new foundry tool which directly effects an increase in yield. It permits accurate determination of the proper procedure in gating and risering "tough" castings. Seventeen cylindrical castings were radiographed simultaneously by Crane Co. to ascertain the most productive and economical foundry practice.

Radium thus performs a valuable additional function.

For inspection, for determination of directional solidification, Radium is available in capsules of various unit strength in duralumin holders which may be leased or purchased at low rates.

The rental includes full coverage insurance; heavy load storage containers and slide rule exposure calculators.

RADIUM CHEMICAL COMPANY, INC. • 570 Lexington Ave., New York (22), N. Y. • Chicago: Marshall Field Annex Bldg.

SPRAY—CLEAN MOLDS

QUICKER AND BETTER WITH

"BRANFORD"

Sprayers & Blow Guns

FULL-INSTANT AIR RELEASE
NO-LEAK SHUT OFF FEATURES

"BRANFORD"
45° Blow Gun

Has a malleable iron body to give long, durable service—

Self-Seating—No Leak Valve

FOR CLEANING—*BENCHES, MOLDS, PATTERNS.*

"BRANFORD"
Cleaner
&
Sprayer

A combination tool—use for spraying liquids and powders or as a plain air jet without changing a connection.

In the Foundry—

FOR CLEANING—*CORES, BENCHES, PATTERNS, MOLDS, FLASKS, ETC.*

FOR SPRAYING—*CORES AND MOLDS WITH SILICA WASH, BLACKING, ETC.*

In the Machine Shop—

FOR CLEANING—*JIGS, TOOLS, MACHINES.*

FOR SPRAYING—*KEROSENE, WHITEWASH, PAINTS.*

"BRANFORD"
Renewable Nozzle
Cleaner
&
Sprayer

The ideal sprayer for silica wash or any solution containing abrasives—nozzle has hardened steel insert tip which is easily replaced when worn.

MADE IN NOZZLE SIZES—⅛" ¼" ⅜" ½"

CATALOG "G" DESCRIBING FULL LINE OF "BRANFORD" VIBRATORS, SHAKEOUT EQUIPMENT, VALVES, ETC.

SENT ON REQUEST

1915 BRANFORD VIBRATORS U.S.A.

NEW HAVEN VIBRATOR CO.

130 CHESTNUT ST. NEW HAVEN, CONN.

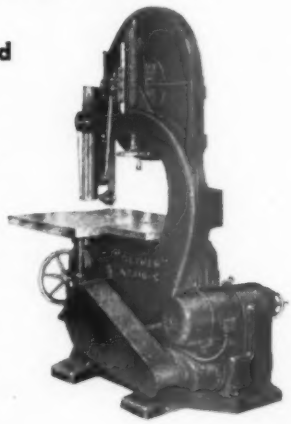
"OLIVER"

36-inch Metal Cutting

BAND SAW

Cuts sprues, risers, gates, heavy and light sections of metals, sheet metals, compositions, wood

A powerful, sturdy Band Saw—the finest built. Cuts true, steady and smooth. Extra large capacity under guide. Has low speed geared head direct connected to lower wheel for cutting heavy cross sections. Also furnished with high speed motor for sawing woods, compositions, sheet metals. Quick-change rim and tire. Also available in 18", 30" and 38" sizes. Write for Bulletins.



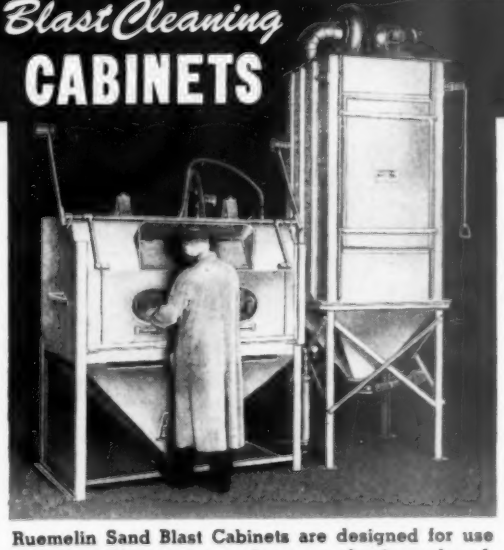
OLIVER MACHINERY COMPANY

Grand Rapids 2, Michigan

RUEMELIN

Blast Cleaning

CABINETS



Ruemelin Sand Blast Cabinets are designed for use in the smaller gray iron, brass or aluminum foundries. Built in many sizes. Furnished complete with dust control equipment. A Rotary Barrel 16" in diameter can be installed in any of these cabinets to clean very small parts automatically.

Write for Bulletin No. 32-B

RUEMELIN MANUFACTURING CO.

3850 N. PALMER ST. • MILWAUKEE 12, WIS., U. S. A.

Manufacturers and Engineers SAND BLAST AND DUST COLLECTING EQUIPMENT, WELDING FUME COLLECTORS

A 5135-1/9A

IT'S NEW—IT'S SENSATIONAL

AMASTEEL

GENUINE ALLOY STEEL

SHOT

LASTS MANY TIMES LONGER

Here at last is peak efficiency in Shot for blast CLEANING and PEENING. AMASTEEL SHOT is far better than ordinary hard iron abrasives because it is TRUE ALLOY STEEL.

Compared to regular blasting materials, AMASTEEL offers an amazing superiority due to its long life and resistance to breakdown and greater CLEANING and PEENING speed. This feature means additional savings on labor, handling, storage, freight costs, and dust disposal.

AMASTEEL is produced under exclusive patents and is available in sizes that meet all CLEANING and PEENING requirements.

Investigate AMASTEEL Shot today. It Lasts Six Times As Long!

PRODUCERS OF
PEENBLAST
CLEANBLAST
ALLOY 99

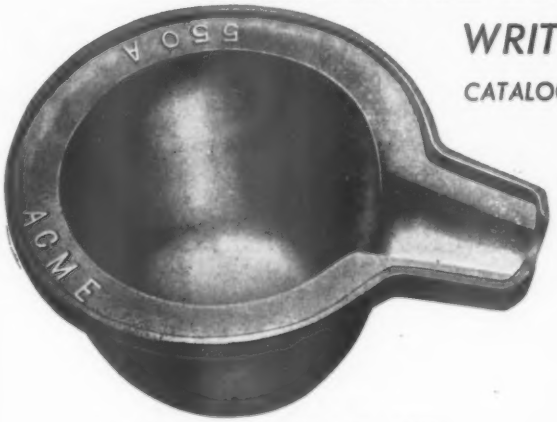
ALLOY METAL ABRASIVE CO.

311 WEST HURON ST. ANN ARBOR, MICH.

MELTING POTS—Ingot Molds

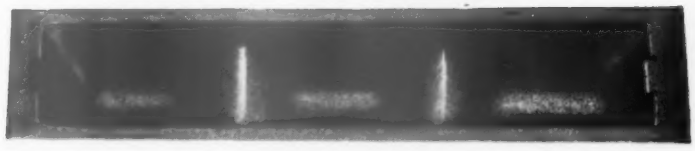
for ALUMINUM AND OTHER NONFERROUS METALS. 45 SIZES.

WRITE for
CATALOG "F"



ROUND SPOUT POT NO. 550A
WITH 1½" COLLAR ON FLANGE

HOLDING——→
BOWL NO. HP7001



INGOT MOLD NO. AA-6

Made of Acme SPECIAL-M-Heat Resisting Iron — They Stand the Heat!

ACME FOUNDRY COMPANY

DETROIT 16, MICHIGAN

2502 TWENTY-SECOND ST. PHONE TASHMOO 5-2404

For more production . . . better morale . . . *install*

Swartwout Ject-O-Valve

● This modern powered roof ventilator forces out masses of heat, smoke and fumes from foundry, glass plant, forge shop and other work rooms, clears the atmosphere for greater comfort and more efficient operations. Ject-O-Valve eliminates air-contaminating elements before they spread—blasts them *straight up* into the outer air and draws *fresh* air from outer walls where it enters. Force from the powerful propeller fan holds pivoted top open, keeps out weather. Top closes tight—weather-proof—when motor stops.

Carefully engineered in five sizes; varying motor-fan ratings to give you a selection of 28 different capacities. Hinged top permits easy access for servicing.

Swartwout *AIRMOVER* for "open roof" ventilation

For situations where ventilation is *general*, requiring removal of unwanted elements over a wide area, the gravity type AIRMOVER practically opens your roofs to the sky . . . with full weather-protection but minimum air-flow resistance. *Write for Bulletin 324.*

The Swartwout Company
18566 EUCLID AVENUE • CLEVELAND 12, OHIO

Swartwout
Controlled **Air Circulation**
EQUIPMENT FOR EFFECTIVE ECONOMICAL VENTILATION OF INDUSTRIAL BUILDINGS

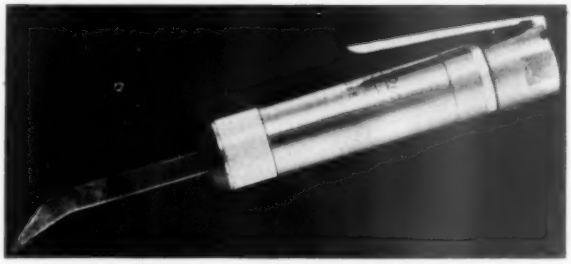
Quantity
PRODUCTION
of
GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866
THE WHELAND COMPANY
FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS
CHATTANOOGA 2, TENNESSEE

Cut costs with the NEW ROTOR SCALER



A rugged 3-pounder with a heavy-weight wallop for these jobs:

- **Weld slag removal**
- **Spatter cleaning**
- **Weld peening**
- **Scaling**
- **Star drilling**
- **Light chipping**

Call in the Rotor Analyst to demonstrate the Rotor Scaler on your work.

THE ROTOR TOOL CO.
CLEVELAND, OHIO

THREE POINTS TO A GOOD ARGUMENT

1 castings sell better when they look better . . . .

2 clean, bright castings follow the use of quality foundry facings . . . . . .

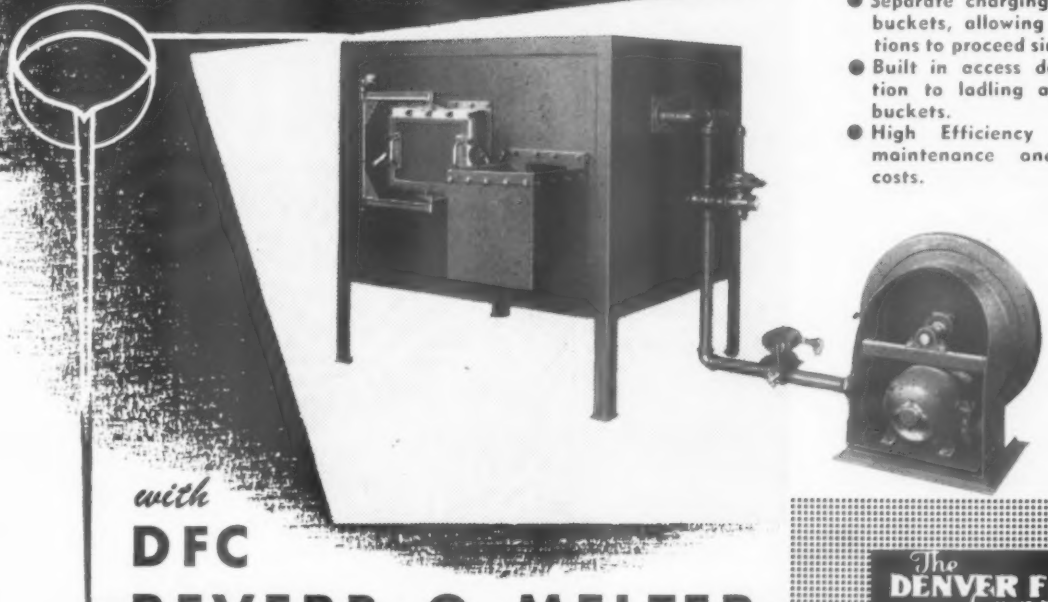
3 Bloomsbury Graphite Co. supplies high quality foundry facings . . . . *and even ships free samples on request.*

BLOOMSBURY

GRAPHITE CO. *(since 1882)* BLOOMSBURY, N. J.

ALUMINUM MELTING SIMPLIFIED

FOR: DIE CASTING . . . PERMANENT MOULDING



Outstanding features include:

- Larger capacity per given size
- No crucibles or pots to replace
- Separate charging and ladling buckets, allowing both operations to proceed simultaneously
- Built in access door in addition to ladling and charging buckets.
- High Efficiency with lower maintenance and operating costs.

with

DFC

REVERB-O-MELTER

WRITE FOR COMPLETE INFORMATION

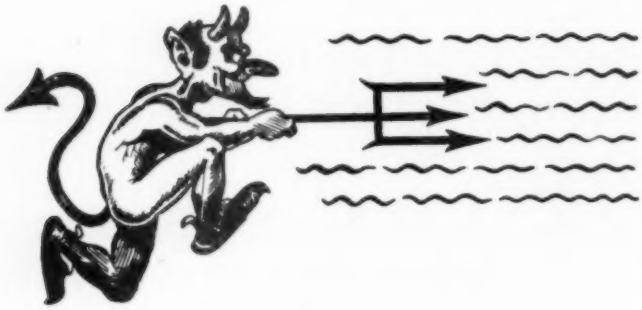
The DENVER FIRE CLAY Company

EL PASO, TEXAS · NEW YORK, N. Y. · DFC · SALT LAKE CITY, UTAH

DENVER, COLO., U. S. A.

SOFFEL'S
THERMOTOMIC ABC

(Patents Pending)



A New Exothermic Feeding Compound and Pipe Eliminator AL-X31 for Aluminum and Magnesium Castings

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

THERMOTOMIC ABC is the first successful exothermic feeding compound ever to be developed for aluminum and magnesium castings. Results obtained from its use are amazing. Feeding metal in heads or risers is maintained in the fluid state from 20 to 30 minutes. Yield on aluminum castings has been greatly increased. Weight of feeding metal in heads or risers has been reduced by as much as 120% in many cases. Due to the restricted feeding neck through the THERMOTOMIC ABC core, and AL-X31 LIQUIDIZER which is used in conjunction with THERMOTOMIC ABC, castings will be free from shrink cracks and porosity. Since the feeding heads or risers will remain liquid longer than the main body of the casting, chills can now be eliminated resulting in more uniform grain structure throughout the casting.

NOTE: Neither THERMOTOMIC ABC nor AL-X31 LIQUIDIZER will contaminate or otherwise injure the metal in any way.

Write for descriptive literature or see your nearest distributor.

PITTSBURGH METALS PURIFYING CO.

Manufacturers of

Fluxes and Purifiers for all Metals and Alloys; also Soffel's Thermotomic Compounds and Soffel's Carbon-Free Liquidizers for Ferrous and Other Non-Ferrous Metals

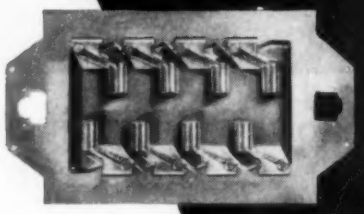
1352 Marvista St., N.S. Pittsburgh, (12) Pa.

Hi Accuracy

ALUMINUM MATCHPLATES

Get casting accuracy and stepped up production with Acme matchplates, core boxes, cope and drag plates. Single or multiple sections from one master pattern. Precision cast. Low clean-up time. Prompt delivery. *"Quotations Furnished."*

Our 17th year as matchplate and core box specialists. Modern aluminum, brass, and bronze foundry. For a combination of accuracy, economy, and service, send specifications and prints to Acme.



★ MATCHPLATES
★ CORE BOXES
★ COPE AND DRAG PLATES
★ PRECISION CASTINGS

ACME ALUMINUM ALLOYS INC.
DAYTON 3, OHIO

BESSEMER FERRO-SILICONS

GLOBE IRON COMPANY

THE PIONEERS OF SILVERY IRON

SPECIAL HIGH SILICON GRADES

YOU CAN'T THINK OF SILVERY IRON WITHOUT THINKING of GLOBE

GLOBE IRON CO JACKSON, O.

QUALITY • DEPENDABILITY • SERVICE
Producers of
PressureProof

ANGELL ANGELL

CHAPLETS
and all types of nails

The Angell Nail
& CHAPLET COMPANY

4580 East 71st Street Cleveland 5, Ohio

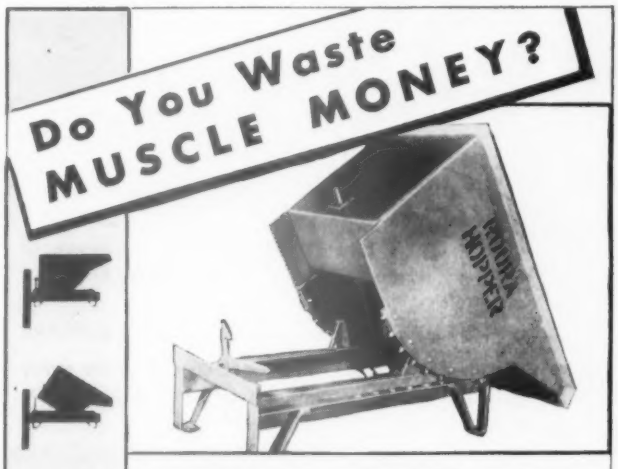
Prevent
CORE BLOWING

WITH
BUFFALO BRAND
Vent Wax

This practical, low cost method of providing cores with safe, clean vents has been saving time and money — and preventing casting losses for leading foundries for nearly forty years. Made in three shapes and eighteen sizes. Write for generous sample.

Buffalo Brand
VENT WAX
UNITED COMPOUND COMPANY
328 South Park Ave., Buffalo 4, N.Y.

Do You Waste MUSCLE MONEY?



ROURA SELF-DUMPING HOPPERS

. . . cut high labor costs of material handling in half.

Eliminate hand work in moving bulk materials. Pull the trip arm and a Roura Hopper automatically dumps, rights and locks in position for the next load. Fits any standard fork or platform lift truck. Sturdy . . . safe . . . quick . . . economical.

Sizes and types for any job. Write today for illustrated bulletin, *"In Dollars & Sense"*.

ROURA IRON WORKS INC.
1405 WOODLAND AVE., DETROIT 11, MICHIGAN

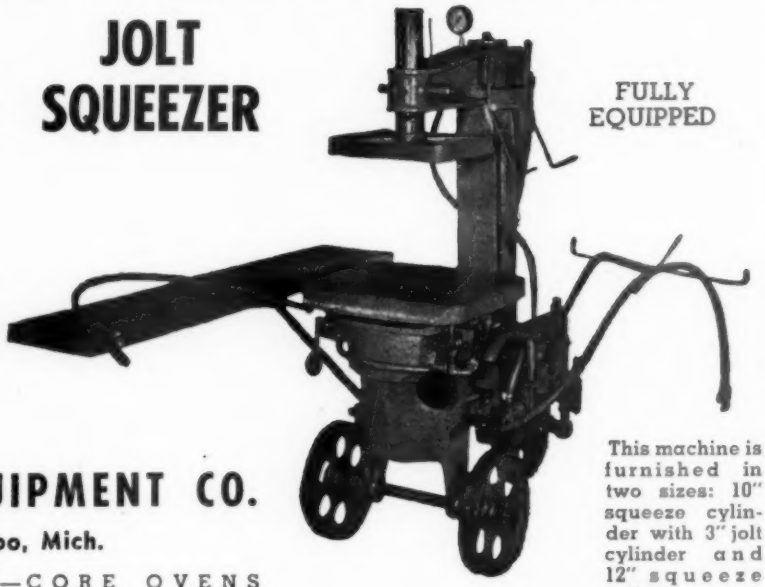
HAYNES EQUIPMENT

JOLT SQUEEZER

FULLY EQUIPPED

• The post and squeeze cylinder on the HAYNES JOLT SQUEEZER is cast all in one piece. There are no bolts or screws in this machine. The top of the post is machined on top with a 2 7/16" cold rolled shaft which the swing arm swings on.

This is a portable machine with three wheels, two in front, one in back, zerk fittings on all moving parts. Comes equipped with air gauge, pop-off gauge and a pin on top of the arm for a gate horn.



This machine is furnished in two sizes: 10" squeeze cylinder with 3" jolt cylinder and 12" squeeze cylinder with 4" jolt cylinder.

HAYNES FOUNDRY EQUIPMENT CO.

814 Ada Street—Kalamazoo, Mich.

LADLES—BRASS FURNACES—CORE OVENS

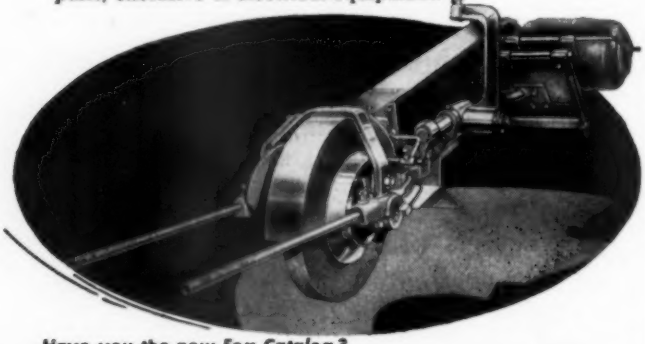
FOX

SWING FRAME GRINDER

• **BALANCE** Perfect center balance of wheel and motor ensures grinding ease and efficiency.

• **SAFETY** "Worker safety" is carefully provided.

• **ECONOMY** Greasing required only once every six months . . . guaranteed for two years against repairs, exclusive of electrical equipment.



Have you the new Fox Catalog?

FOX GRINDERS, INC.

OLIVER BUILDING PITTSBURGH 22, PA.

DOUBLE YOUR PRODUCTION—with the fastest and most powerful Rammer made—

NO. 4 DAYTON RING VALVE BENCH RAMMER

•

Aside from its efficiency, the chief advantage of this Rammer lies in its long life. The Valve Unit will last for years without repair or replacement. The Cylinder Bore and Piston Rod are HARD CHROME PLATED, features which double the life of the Rammer and reduce maintenance costs at least one-half.

Have been adopted as standard by some of the largest users of Rammers throughout the Country. MADE IN FIVE SIZES Send for Bulletin No. 300.

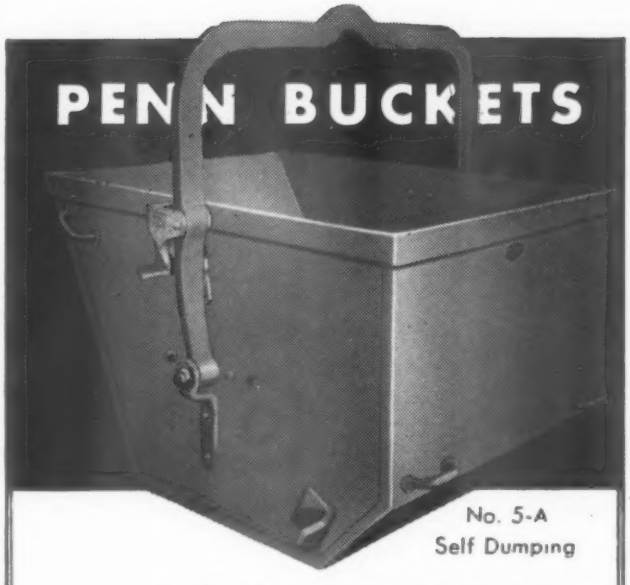
DAYTON PNEUMATIC TOOL CO., DAYTON, O.

LEADERS
IN THE FOUNDRY INDUSTRY OF THE EAST NEVER STRIKE A HAIR-MAULING STANCE

At least not over anything for the foundry . . . for they know that "everything for the foundry" is just over night away for all within the area from the Carolinas to Canada . . . that when we say "everything" we mean EVERY-THING and nothing short of it.

PENNSYLVANIA FOUNDRY SUPPLY & SAND CO.
ASHLAND & EAST LEWIS STREETS
PHILADELPHIA 24 Telephone JE 5-1012

PENN BUCKETS



No. 5-A
Self Dumping

Careful balancing makes Penn Buckets self dumping when loaded and self righting when empty. Welded construction prevents "clinging" makes them empty easily and completely.

MEMBER

WRITE TODAY FOR NEW BULLETIN DIMENSION SHEET AND PRICE LIST

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READING, PENNA.

ELIMINATE LOCALIZED HEAT FOR CORES—FOR MOULDS

ELIMINATE
Bridge Walls
Fire Boxes
Firing Tunnels
Fans, Stacks and Flues

No Unburned Fuel
No Carbon Deposits
No Flame Impingement

EASILY
Installed
Lighted
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Economical
Clean
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Proven

QUICK CONVERSION
LET US HELP SOLVE YOUR BAKING PROBLEMS
Additional Information Given On Request

THE SPIN-O-TROL CO.
16 PERRY STREET BUFFALO 3, N. Y.

★ Sharper Castings
★ Greater Brinell Hardness
★ Increase Tensile Strength
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NON-FERROUS METAL MELTING FURNACES

SELECTION TABLE

	TYPE	Max. Temp.	Series	Recommended for	Bulletin No.
TILTING	CRUCIBLE	2500°F.	TCR	Melting Brass and Copper	TC-45
		1400°F.	TCA	Melting Aluminum	TC-45
	POT	1400°F.	TP	Melting Aluminum and Magnesium	TP-45
STATIONARY	CRUCIBLE	2500°F.	CR	Melting Brass and Copper	CR-45
		1400°F.	AC	Melting Aluminum	AC-45
	POT	1400°F.	AM	Melting Aluminum	AM-45
		1200°F.	SM	Melting Soft Metals	AM-45
		1000°F.	SA SAV	Melting Soft Metals	SV-45

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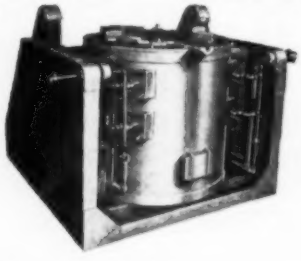

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SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO

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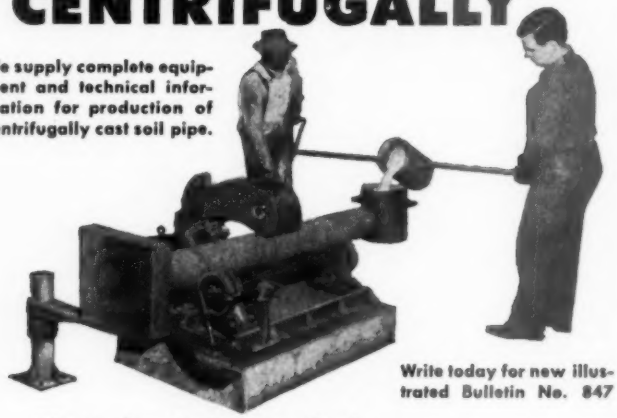
We supply complete equipment and technical information for production of centrifugally cast soil pipe.



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This Modern Method Provides for:

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- Small Man-Hour Labor Cost
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- Pipe Sizes from 2-inch Diameter Upwards

CENTRIFUGAL CASTING MACHINE CO.
P. O. Box 947 *Nathan Janco, Pres.* Tulsa 1, Okla.

HELPFUL LITERATURE

NOTE TO READERS: If you will check the item or items described which particularly interest you, we will be glad to request the manufacturers concerned to send you their literature. Use the attached postal card.

1. Materials Handling

Cleveland Crane & Engineering Co. —8-page illustrated "Cleveland Crane Graphic" Vol. 5 No. 2 is devoted to Tramrail beam handling system that provides safety and convenience. Units are shown in operation in numerous foundry applications. Diagrams show installation layouts and other features.

2. Weld Salvage of Castings

Eutectic Welding Alloys Corp.—2-page illustrated bulletin "Eutectic Low Temperature Welding Rods for Salvaging Castings" describes practical procedures for salvaging cast iron, bronze, aluminum and malleable iron castings.

3. Melting Furnaces

Johnson Gas Appliance Co.—Illustrated data sheet "Johnson Metal Melting Furnaces" outlines features and lists specifications of model No. 1019 heavy duty melting furnace, model No. 313 soft-metal furnace, model No. 616 furnace having 600 pound soft-metal capacity and other smaller units. Standard and accessory equipment are described.

4. Hand Trucks

Rapids-Standard Co. — Illustrated data sheet No. WE-45W describes popular line of Wheel-Ezy hand trucks. Units are shown in various sizes. Specifications are charted and features outlined.

5. Control Valves

C. B. Hunt & Son, Inc.—12-page illustrated bulletin No. 107B is descriptive of Quick-As-Wink control valves for air, water or oil system operation. Foot, hand, diaphragm and solenoid operated types are depicted. General information section provides specifications and lists accessory equipment.

6. Alloying Element

General Cerium Co.—4-page illustrated folder No. 101 is composed of information relative to Mischmetal. This alloying element is a mixture of rare earth elements composed mostly of Cerium. It alloys readily with many metals, oxidizes rapidly and therefore serves as good reducing agent. In addition, the exothermic characteristics prolong fluidity of molten metals appreciably.

7. Small Grindstone

Cleveland Quarries Co.—4-page illustrated folder "The Grindstone of a Thousand Uses" describes the Ohioan model CQ grindstone which has been designed for sharpening of small tools. Unit is suitable for bench mounting.

8. Boron Additive

Norton Co. — 4-page illustrated folder form No. 632 describes use of Norton boron Master Alloy, a chemically balanced alloy of boron and iron to be used as additive in steel and cast iron. Compositions, advantages and costs are discussed.

9. Masonry Saw

Clipper Mfg. Co.—4-page illustrated folder "Something Really New" points out advantages of dustless masonry saw which is equipped with dual control. Unit provides for full-vision cut and maximum safety of operation. Cuts can be made in concrete block, brick, tile and other ceramic or masonry materials.

10. Magnetic Separation

Dings Magnetic Separator Co.—4-page illustrated bulletin No. 1120 describes laboratory and industrial service available to aid in solving materials separation problems by means of magnetic equipment. Service is free to industry and is intended to aid in development of new and improved separation processes.

11. Buffing Cloths

Divine Brothers Co.—Buff Cloth bulletin FDB-3 provides ten samples of cloth used for making buffs. Materials are glued to page in such manner that they can be examined. Each swatch is described, and recommendations are made for use.

12. Industrial Furnace

Sklenar Furnace & Mfg. Co.—4-page illustrated folder "The New Sklenar Improved Reverberatory Furnaces" describes details and discusses functions and scope of these furnaces which utilize new process in melting of all kinds of metals. Photodiagrams show principle of operation, and tables provide melting rates and capacities.

13. Lubrication Equipment

C. A. Norgren Co.—24-page illustrated catalog No. 400d is descriptive of line of sight feed air line lubricators, trolley lubricators, Lubro-Control units, high speed spindle lubricating devices, regulator units, relief valves, pneumatic hose couplings and numerous other products.

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14. Diecasting Machine

Kux Machine Co.—6-page illustrated folder "Kux Proudly Presents the New Model K" provides specifications; describes double toggle mechanism, positive ejection, speed and power; and illustrates model K5 horizontal and K7 vertical diecasting machines. Typical castings produced are shown.

15. Hoists

Coffing Hoist Co.—4-page illustrated catalog form No. MP-1 describes Mighty-Midget pulling device which is capable of pulling and lifting to capacity of 500 pounds. It is adaptable for use by utilities, companies, shops and plants.

16. Dust Control System

Aget-Detroit Co.—4-page illustrated folder No. 510 provides information on Dustkop dust collectors for use with grinding, polishing and buffing equipment and on line of vapor collectors which trap mist and vapor from thread grinders and centerless grinders.

17. Pressure Cast Matchplates

Carlson Pattern Shop Inc.—16-page illustrated vest-pocket size publication "Carlson Pressure-Cast Matchplates" describes actual production operations involved in making aluminum matchplates from original inspection of master pattern to final inspection of finished plate.

18. Bronze Welding Electrodes

Ampco Metal, Inc.—24-page illustrated bulletin No. W-17 covers welding technique and procedures using bronze welding electrodes. Weldability chart is included showing diverse types of applications with recommendations on which Ampco bronze electrode to use.

19. Casting Additives

Atlantic Chemicals & Metals Co.—10-page illustrated bulletin "Immunitas Products" provides information relative to advantages and economies gained through use of selected additives for aluminum, brass and bronze, nickel based alloys, zinc and zinc based alloys, tin lead alloys, and for iron and steel.

20. Hooks, Tongs, Grips & Slings

Downs Crane Hoist Co.—16-page illustrated bulletin No. 200 describes hooks, grips, tongs and slings for safe handling of heavy loads. Construction features, capacity ratings, safety factors and specifications are given.

21. Hand-Pushed Trolleys

Jervis B. Webb Co.—4-page illustrated folder describes Webb hand-pushed trolleys. They can be used in systems of monorails with switches, curves and other accessories installed to suit requirements. Side roller construction assures easy operation and low wear on curved track.

22. Processing Ovens

Gehnrich & Gehnrich, Inc.—32-page illustrated manual "How to Select the Right Oven for Your Process" is concerned with various heating, heat treating, baking and curing problems. Also discussed are the four basically different types of oven heating systems and their various applications. Oven selection tables are provided for reference.

23. Industrial Air Conditioning

Powermatic Ventilator Co. — 22-page illustrated catalog "Iron Lung for Industrial Buildings" presents information relative to methods and equipment designed to improve air conditions in industrial plants. Numerous applications are shown.

24. Abrasive Blasting

American Wheelabrator & Equipment Corp.—16-page illustrated catalog No. 214-A is devoted to the 24, 48, 66, 72 and 86-inch swing table units for airless blast machines for cleaning of stove and furnace castings, heat treated work, gears, winches, valve bodies, motor housings, pulleys, weldments, etc.

25. Core & Mold Ovens

Foundry Equipment Co.—6-page illustrated folder No. 48 is devoted to quick-dry, transrack, rolling drawer, horizontal, car type and tower ovens as well as continuous mold dryers, portable dryers and continuous redry ovens.

26. Foundry Equipment

Sterling Wheelbarrow Co. — 56-page illustrated catalog No. 59 relates information on line of foundry equipment such as flasks, flask bars, flask pins, steel bushings, steel core plates, wheelbarrow wheels, core trucks, casters and steel wheels, steel bands and upsets, hardwood wedges, and many others.

27. Bonding Clays

Eastern Clay Products, Inc.—24-page illustrated catalog "Greater Production Facilities" provides recommended uses for five bonding clays together with many combinations. Such materials as Revivo Bond, Black Hills Bentonite and Dixie Bond are covered. In addition, the EPC line includes balanced Revivo Super bonds as well as Eifort Fire clays, Revivo core paste and Revivo drybond.

28. Blast Cleaning Equipment

Pangborn Corp.—16-page illustrated bulletin No. 215 describes Rotoblast cleaning table as versatile piece of equipment suitable for diversified work. Controlled centrifugal force delivers abrasive at great force. Publication recommends applications.

29. Gray Iron Castings

International Nickel Co.—8-page illustrated bulletin "Nisiloy for Gray Iron Castings" discusses machinability, density and uniform properties of castings after addition of Nisiloy.

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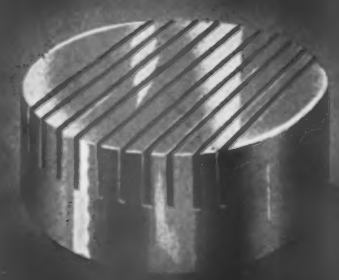

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Here's part of a complete line of DEMMLER core box vents—rigidly constructed in varying sizes of slotted brass—slotted steel—and screen mesh. Orders filled promptly from stock.

BRASS SLOTTED CORE BOX VENTS
Slot widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

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Slot widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

SCREEN TYPE CORE BOX VENTS
Mesh: #30, #40, #50.
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

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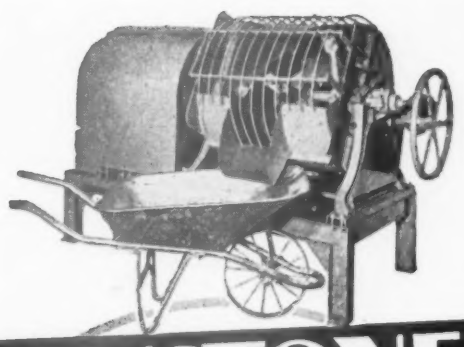

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YEAR AFTER YEAR, in foundries great and small, these wet cleaning mills clean many types and sizes of castings at

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TWO TYPES

End-loading, end-unloading Side-loading, side-unloading.

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Illustrated is a cut-away view of Ransohoff End-loading, end-unloading mill.

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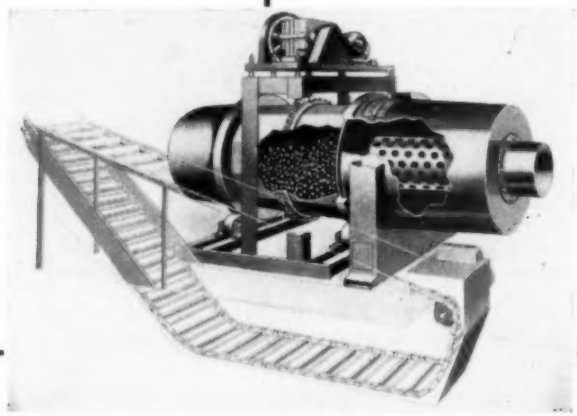
They're an investment that pays off BIG!

In addition: here are some of the superior features: no dust; no rust; no health hazards; no dust-collecting systems needed; mills are not self-destructive; no manual handling of stars . . . operation is easy, gentle, economical.



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HARD CHROMED • PORTABLE PNEUMATIC TOOLS

DO MORE WORK AT LESS COST

because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

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IF YOUR PROBLEM INCLUDES

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SALES • SERVICE • STOCK • COAST TO COAST

PENTON'S FOUNDRY LIST

for

1947 *and* 1948

Gives names and addresses of 5993 foundries in the United States and Canada and tells the kind of castings, steel, brass or aluminum. Shows the number, kind and size of melting units operated by each plant and the total daily melting capacity—the surest indicator of the size and importance of a foundry.

Penton's Foundry List is recognized as the only list of foundries giving such valuable information arranged for quick, ready reference.

Price $50.00

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DRAVO CRANE CAB COOLERS REDUCE OPERATING HAZARDS

- Excessive heat, obnoxious fumes, annoying dust and moisture reduce the alertness and efficiency of your hot-metal crane operators.
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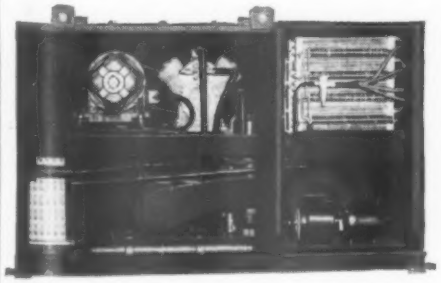

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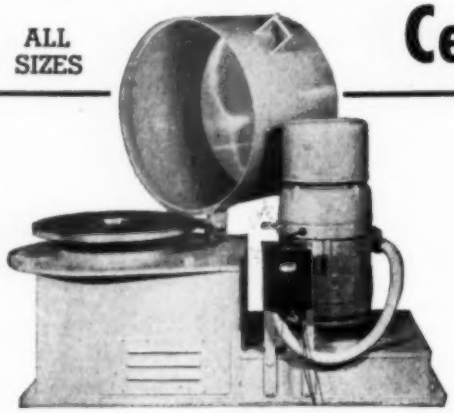

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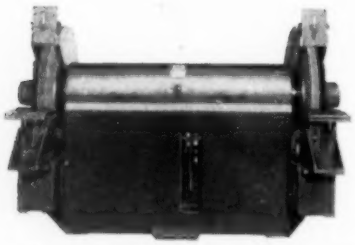

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Constant cutting speed is automatically maintained by adjustment of the work rest to the wheel diameter. This machine may also be supplied as a Multi-Speed Grinder having three wheel speeds.

You'll want further information on the Vari-Speed Grinder or other Marschke Grinders which include pedestal and floor stand grinders and buffers, heavy duty Swing Frames and the "In-Between" Grinder.

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3/4 SIZE

Severance CARBIDE MIDGET MILLS

Operate at grinding-wheel speeds
Outlast scores of mounted points
Cut 50 times faster
MANY SHAPES and SIZES
Cut hard materials - Rockwell 65-C

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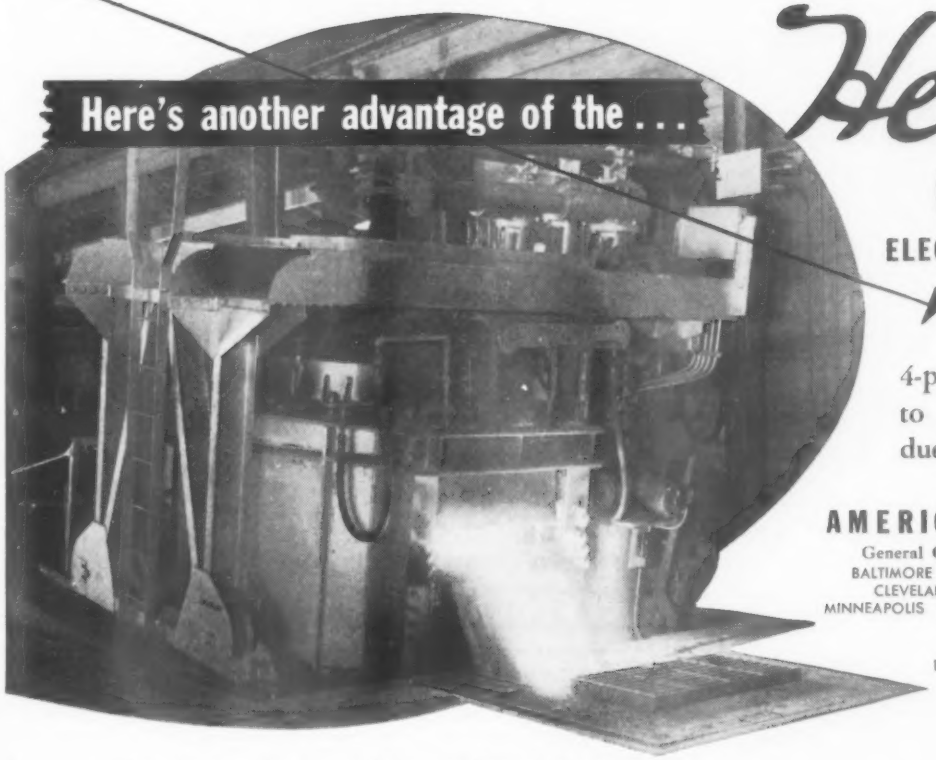

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Removable roof has 4-point support for lifting, to reduce refractory-damage due to warping.

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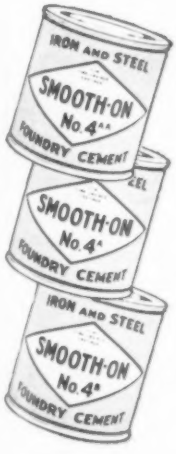
LIGHT — MEDIUM — DARK

. . . a shade to match every iron or steel casting



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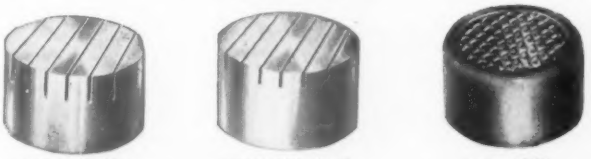
A SPECIFIC TYPE FOR EVERY CORE BOX
CORE BOX VENTS
SLOTTED OR SCREEN



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Wide or Narrow Slots
.014 .010

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.014 .010

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INSERTING DRILLS for inserting Core Vents

• Uniformity of holes • Faster insertion of vent
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VENT CLEANER for cleaning slots

MADE OF TEMPERED STEEL, EASY TO USE

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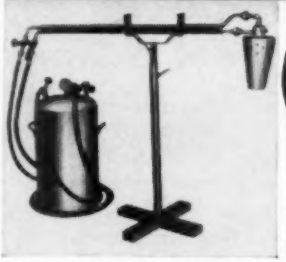

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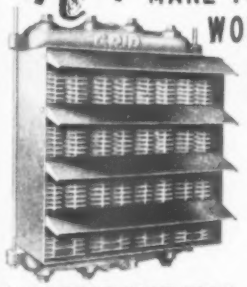

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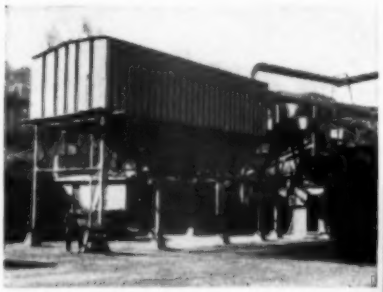

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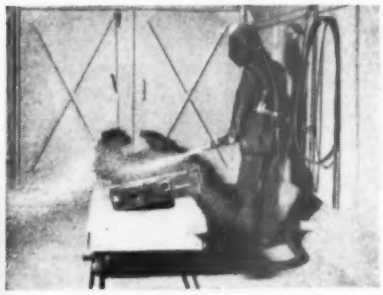

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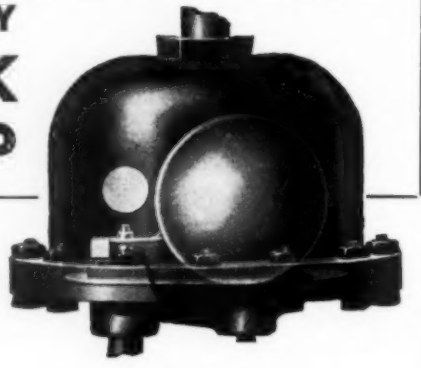

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Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

CUTTING OILS

E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

DARK ROOM ACCESSORIES (X-Ray)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.

DARK ROOM PROCESSING (Chemical Tanks, etc.)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.

DEGASIFIERS

Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

DEOXIDIZERS

Alter Company, 1702 Rockingham Rd., Davenport, Iowa.
Ajax Metal Co., 46 Richmond St., Philadelphia 23, Pa.
American Smelting and Refining Co., 120 Broadway, New York 5.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

DEOXIDIZERS (Ferrous)

Carborundum Co., Perth Amboy, N. J.

DESULPHURIZERS

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.
Modern Equipment Co., Port Washington, Wis.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DIE CASTING MACHINES

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, O.
Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio.
Light Metal Machinery Inc., 736 Penton Building, Cleveland 13, Ohio.

DIE CASTING MACHINES (Cont'd.)

Miller-Taylor Tool Co., 5005 Euclid Ave., Cleveland 3, Ohio.

DIES

Acme Aluminum Alloys Inc., 232 North Findlay St., Dayton 3, Ohio.
Alumicast Corp., 1515 No. Kilpatrick, Chicago 51, Ill.
City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio

DIRECT FIRED HEATERS

Dravo Corp., Dravo Bldg., Pittsburgh 22, Pa.

DOWEL PINS

Standard Horse Nail Corp., New Brighton, Pa.

DRILLS (Electric)

Standard Electrical Tool Co., 2488 Riverside Ave., Cincinnati 4, Ohio.

DRILLS (Pneumatic)

Gardner-Denver Co., Quincy, Ill.
Schramm Inc., West Chester, Pa.

DRIVES (Reciprocating)

Ajax Flexible Coupling Co., Westfield, N. Y.

DRUMS (Magnetic)

Dings Magnetic Separator Co., 4720 W. McGeough, Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 662 S 28th St., Milwaukee 4, Wis.

DUMP HOPPERS

Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

DUMP TRUCKS

Bell Aircraft Corp., Niagara Falls, N. Y.

DUST ARRESTING EQUIPMENT

American Air Filter Co., Inc., 266 Central Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Reumelin Mfg. Co., 3860 N. Palmer St., Milwaukee 12, Wis.
Schneible Co., Claude B., 2827-25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Westinghouse Electric Corp., B. F. Sturtevant Div., 40 Wall St., New York 4, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DUST COLLECTORS

Schmieg Industries, 6560 Cass Ave., Detroit 2, Mich.
Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.

DUST COLLECTOR (Shake-out)

Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.

DUST RECOVERY SYSTEMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Kirk & Blum Mfg. Co., Cincinnati 25, O.

DUST RECOVERY SYSTEMS (Cont'd.)

Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

DYES & CHEMICALS

Eaton Chemical & Dyestuff Co., 1490 Franklin, Detroit, Mich.

ELECTRIC FURNACES (see Furnaces, Electric)

ELECTRODES (Graphite and Amorphous)

International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co., Inc., Electrode Sales Div., 30 E. 42nd St., New York 17, N. Y.

ELEVATORS

Standard Conveyor Co., North St. Paul 9, Minn.

ELEVATORS (Bucket)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Chain Belt Co., 1671 W. Bruce St., Milwaukee 4, Wis.
Jeffrey Mfg. Co., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chiago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.

ELEVATORS (Material Handling)

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

ELEVATORS (Pneumatic, Material Handling)

Fuller Co., Catasauqua, Pa.

ENGINEERING SERVICE (Foundry)

Carman, Edwin S., Lee Rd. at Mayfield, Cleveland 18, O.
Frank D. Campbell, 332 So. Michigan Ave., Chicago, Ill.
Conover Engineering Co., 1740 East 12th St., Cleveland 14, Ohio.
Engineering Service Inc., 610 West Michigan St., Milwaukee 3, Wis.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
A. H. Putnam Co., 1319 2nd Ave., Rock Island, Ill.
Reichert, W. G., Engineering Co., 1060 Broad St., Newark, N. J.
Swan, Harry B., 2983 East Grand Blvd., Detroit, Mich.
Westover Engineers, 424 E. Wells St., Milwaukee 2, Wis.
Wickland Co., A. A., 205 W. Wacker Dr., Chicago 6, Ill.

ENGINEERING SERVICE (Permanent Mold)

Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

EXHAUST SYSTEMS

American Air Filter Co., Inc. Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corporation, Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Propellair Inc., Springfield, O.
Schmeig Industries, 6560 Cass Ave., Detroit 2, Mich.

EXHAUST SYSTEMS (Cont'd.)

Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Westinghouse Electric Corp., B. F. Sturtevant Div., 40 Wall St., New York 4, N. Y.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FABRICATORS (Metal)

Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

FACINGS

Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Stevens Inc., Frederic B., Detroit 16, Mich.
Superior Flake Graphite Co., 33 S. Clark St., Chicago 3, Ill.
United States Graphite Co., Saginaw, Mich.

FANS

General Blower Co., Morton Grove, Ill.

FANS (Ventilating, Exhaust, Cooling, etc.)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Joy Mfg. Co., La Del Division, New Philadelphia, Ohio.
Pangborn Corp., Hagerstown, Md.
Propellair Inc., Springfield, O.
Westinghouse Electric Corp., B. F. Steurtevant Div., 40 Wall St., New York 4, N. Y.

FEEDERS (Rotary)

Fuller Company, Catasauqua, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Newaygo Engineering Co., Newaygo, Mich.

FEEDERS (Sand)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

FERROBORON

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROCHROME

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Hickman-Williams & Co., Cleveland, O.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROCOLUMBIUM

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

FERROMANGANESE

Bethlehem Steel Co., Bethlehem, Pa.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 2, O.

FERROMOLYBDENUM

Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.
Molybdenum Corporation of America, Pittsburgh 19, Pa.

FERROSILICON

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Globe Iron Co., Jackson, Ohio.
Jackson Iron & Steel Co., Jackson, O.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTITANIUM

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTUNGSTEN

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROVANADIUM

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FILM (X-Ray)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.

FILTERS (Air)

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.
Dollinger Corp., 36 Centre Park, Rochester 4, N. Y.

FILTERS (Liquid)

Dollinger Corp., 36 Centre Park, Rochester 4, N. Y.

FINISHING EQUIPMENT

Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.

FIRE BRICK

Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.
Carborundum Co., Perth Amboy, N. J.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Norton Co., Worcester 6, Mass.
Robinson Clay Products Co., 1100 Second National Bldg., Akron, Ohio.
Stevens Inc., Frederic B., Detroit 16, Mich.

FIRE CLAY

Eastern Clay Products, Inc., Jackson, O.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Robinson Clay Products Co., 1100 Second National Bldg., Akron, Ohio.

FIRE SAND

Carborundum Co., Niagara Falls, N. Y.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FIRESTONE

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FLASK BANDS

Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

FLASK BUSHINGS

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Universal Engineering Co., Frankenmuth, Mich.

FLASK PINS

Diamond Clamp & Flask Co., Richmond, Ind.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Universal Engineering Co., Frankenmuth, Mich.

FLASKS (Aluminum)

Adams Co., Dubuque, Iowa.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASKS (Dowmetal)

Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASK FILLERS

Bartlett & Snow, C. C., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Jeffrey Mfg. Co., Columbus 16, O.

FLASKS (Slip)

Adams Co., Dubuque, Iowa.
Diamond Clamp & Flask Co., Richmond, Ind.
Fremont Flask Co., Fremont, O.
Freeman Supply Co., Toledo 5, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

FLASKS (Snap)

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div. Rockwell Mfg. Co., Freeport, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Stevens, Inc., Frederic B., Detroit 16, Mich.

FLASKS (Steel)

Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Shanafelt Mfg. Co., 2623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

FLASK FITTINGS

Adams Co., Dubuque, Iowa.
Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Diamond Clamp & Flask Co., Richmond, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

FLASK FITTINGS (Cont'd.)

Shanafelt Mfg. Co., 3623 Winfield Way, N.E., Canton 5, Ohio.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

FLASK LIFT MACHINES

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

FLASK LUMBER

Dougherty Lumber Co., 4300 E. 66th St., Cleveland 5, O.

FLASKS (Wood)

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.

FLEXIBLE SHAFT MACHINERY

Strand Co., N. A., 5001 N. Wolcott Ave., Chicago 40, Ill.

FLOORING (Non-Slip)

Norton Co., Worcester 6, Mass.

FLUXES

American-British Chemical Supplies Inc., 180 Madison Ave., New York 16, N. Y.
Atlantic Chemical & Metals Co., 1925 N. Kenmore, Chicago 14, Ill.
Carbon Limestone Co., Youngstown, Ohio.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.
National Pigment Co., East York St., Philadelphia, Pa.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.
Thiem Products Co., 647 East Virginia St., Milwaukee 4, Wis.

FLUXES (Soldering, Welding & Tinning)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

FOUNDRY ENGINEERS

Aimes Co., Inc., 2424 Euclid Ave., Cleveland, Ohio.

FOUNDRY LAYOUT & METHODS

Frank D. Campbell, 332 So. Michigan Ave. Chicago, Il[1].
Conover Engineering Co., 1740 East 12th St., Cleveland 14, Ohio.
Engineering Service Inc., 610 West Michigan St., Milwaukee 3, Wis.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
Reichert Engineering Co., W. G., 1060 Broad St., Newark, New Jersey.

FOUNDRY NAILS

Standard Horse Nail Corp., New Brighton, Pa.

FOUNDRY SHOVELS
(See SHOVELS)

FOUNDRY SUPPLIES

Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.

FOUNDRY SUPPLY HOUSES

Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Eastern Clay Products, Inc., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundries Materials Co., Coldwater, Mich.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, O.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Stevens, Inc., Frederic B., Detroit 16, Mich.

FOUNDRY SYSTEMS

Engineering Seervice Inc., 610 West Michigan St., Milwaukee 3, Wis.
Reichert Engineering Co., W. G., 1060 Broad St., Newark, New Jersey.

FURNACES (Aluminum & Magnesium Billets)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

FURNACES (Aluminum & Magnesium Forgings)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 ColumbusRd., Cleveland 13, Ohio.

FURNACES (Aluminum Melting)

Ajax Engineering Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Surface Combustion Corp., Toledo 7, Ohio
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Aluminum Rivet Heating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Despatch Oven Co., Minnesapolis 14, Minn.

FURNACES (Annealing)

Campbell-Hausfeld Co., Harrison, Ohio.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Crucible Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Johnston Mfg. Co., Minneapolis 13, Minn.
Randall Foundry Equipment Corp., 4600 E. 71st St., Cleveland 5, O.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

FURNACES (Electric Melting)

Ajax Electric Furnace Corp., 46 Richmond St., Philadelphia 23, Pa.

FURNACES (Electric Melting) (Cont'd.)

Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Greene Electric Furnace Co., 2702 6th So., Seattle 4, Wash.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Gas or Oil Fired)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Denver Fire Clay Co., 2301 Blake St., Denver, Colo.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.
Randall Foundry Equipment Corp., 4600 E. 71st St., Cleveland 5, O.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Gray Iron Melting)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Heat Treating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Johnston Mfg. Co., Minneapolis 13, Minn.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

FURNACES, HEAT TREATING (Electric)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.

FURNACES (Malleable Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.

FURNACES (Malleable Annealing) (Cont'd.)

Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.
Young Brothers Co., 6508 Mack Ave., Detroit 7, Mich.

FURNACES (Malleable Melting)

American Bridge Co., Pittsburgh 19, Pa.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Nonferrous Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., Harrison, O.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Randall Foundry Equipment Corp., 4600 E. 71st St., Cleveland 5, O.
Stroman Furnace & Engineering Co., Div of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
Surface Combustion Corp., Toledo 7, Ohio
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Powdered Coal)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Steel Melting)

Ajax Electrothermic Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACE BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Roots-Connersville Blower Corp., Connersville, Ind.

FURNACE BOTTOMS

Industrial Silica Corp., Stambaugh Bldg., Youngstown, O.

FURNACE LININGS

Campbell-Hausfeld Co., Harrison, O.
Carborundum Co., Perth Amboy, N. J.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Ironton Fire Brick Co., Ironton, O.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
United States Graphite Co., Saginaw, Mich.

GAGES

Acme Aluminum Alloys Inc., Dayton 3, Ohio.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

GAGGERS

Federal Foundry Supply Co., 4600 E. 71st Cleveland 5, O.

GAS

American Gas Association, 420 Lexington Ave., New York 17, N. Y.

GAS BURNERS

Fisher Furnace Co., 2543 West Hubbard St., Chicago 12, Ill.
North American Mfg. Co., 4455 E. 71st St., Cleveland 4, O.

GENERATORS (Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

GLOVES (Industrial, Safety)

American Optical Co., Southbridge, Mass.
C. Walker Jones Co., 6135 Lambert St., Philadelphia 38, Pa.

GOGGLES and EYE PROTECTORS

American Optical Co., Southbridge, Mass.
Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Willson Products Inc., Reading, Pa.

GRAPHITE

Acheson Colloids Corp., Port Huron, Mich.
Asbury Graphite Mills, Asbury, N.J.
Bloomsbury Graphite Co., Bloomsbury, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17.
Superior Flake Graphite Co., 33 S. Clark St., Chicago 3, Ill.
United States Graphite Co., Saginaw, Mich.

GRINDERS (Electric Portable)

Chicago Pneumatic Tool Co., 8 East 44th St., New York 17.
Independent Pneumatic Tool Co., Aurora, Ill.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.
Standard Electrical Tool Co., 2488 Riverside Ave., Cincinnati 4, Ohio.
U. S. Electrical Tool Co., Cincinnati 4, O.

GRINDERS (Flexible Shaft)

N. A. Strand Co., 5001 N. Wolcott Ave., Chicago 40, Ill.

GRINDERS (Pneumatic Portable)

Chicago Pneumatic Tool Co., 8 East 44th St., New York 17.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Independent Pneumatic Tool Co., Aurora, Ill.
Master Pneumatic Tool Co., Inc., Keith Bldg., Cleveland, Ohio.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

GRINDERS (Surface, Bench, Disc, Floor)

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Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis 2, Ind.

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GRINDING WHEELS—See ABRASIVE WHEELS

GRINDING WHEEL DRESSERS

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Desmond-Stephan Mfg. Co., Urbana, O.
Vincent Steel Process Co., 2424 Bellevue St., Detroit 7, Mich.

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Bay State Abrasive Products Co., Westboro, Mass.
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GRIT (Abrasive)

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American Wheelabrator & Equipment Co., Mishawaka, Ind.
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Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Globe Steel Abrasive Co., Mansfield, O.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

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Independent Pneumatic Tool Co., Aurora, Ill.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Master Pneumatic Tool Co., Inc., Keith Bldg., Cleveland, Ohio.
Schramm Inc., West Chester, Pa.

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Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

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Brown Instrument Co. Div. Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia 44, Pa.
Foxboro Company, Foxboro, Mass.
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Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.

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Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N.Y.

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Ajax Electrothermic Corp., Trenton, N. J.

HEATERS (Indirect Fired)

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HEATERS (Space, Unit, Oven, Water)

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Westinghouse Electric Corp., B. F. Sturtevant Div., 40 Wall St., New York 4, N. Y.

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American Optical Co., Southbridge, Mass.
Mine Safety Appliance Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, O.

HELMETS (Welding)

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Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis 20, Mo.
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Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.

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Herman Pneumatic Machine Co.,
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International Molding Machine Co.,
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Freeman Supply Co., Toledo 5, O.

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Buffalo Pattern Works, 830 Hertel Ave., Buffalo, N. Y.
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Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

SMELTERS & REFINERS

American Smelting and Refining Co., 120 Broadway, New York 5.
Christiansen Corp., 1515 No. Kilpatrick, Chicago 51, Ill.
R. Lavin & Sons Inc., 3426 S. Kedzie Ave., Chicago 23, Ill.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

SNAGGING WHEELS—See ABRASIVE WHEELS

SNAP FLASKS

Adams Co., Dubuque, Iowa.
Diamond Clamp & Flask Co., Richmond, Ind.
Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

SODA ASH

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.

SOLDER

American Smelting and Refining Co., 120 Broadway, New York 5.

SPACE HEATERS

Dravo Corp., Dravo Bldg., Pittsburgh 22, Pa.

SPECIAL FOUNDRY ALLOYS

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

SPRAY GUNS

Murphy & Co., Jas. A., Hamilton, O.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.

SPRUE CUTTERS

Adams Co., Dubuque, Iowa.
Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee, Wis.

STEEL (High Speed)

Bethlehem Steel Co., Bethlehem, Pa.

STEEL (Structural)

Alter Company, 1702 Rockingnam Rd., Davenport, Iowa.
American Bridge Co., Pittsburgh 19, Pa.

STRIPPING MACHINES

Adams Co., Dubuque, Iowa.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
International Molding Machine Co., 2608 W. 16th St., Chicago 8, Ill.
Milwaukee Foundry Equipment Co., 3228 W. Pierce St., Milwaukee, Wis.

SURFACE TREATMENT METALS

N. Ransohoff, Inc., 208 W. 71st St., Cincinnati 16, O.

TAPER PINS

Standard Horse Nail Corp., New Brighton, Pa.

TEMPERATURE CONTROLLERS

Brown Instrument Co. Div. Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia 44, Pa.
Foxboro Company, Foxboro, Mass.
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane Columbus 1, O.

TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

TESTING LABORATORIES

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

TESTING MACHINERY

W. C. Dillon & Co. Inc., 5410 W. Harrison St., Chicago 44, Ill.

TESTING MACHINES (Tensile)

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

THERMOCOUPLES

Brown Instrument Co. Div. Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia 44, Pa.
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.
Pyrometer Instrument Co., Bergenfield, N. J.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

TIERING MACHINES (Power)

Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.

TIMERS (Electric)

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

TIN

American Smelting and Refining Co., 120 Broadway, New York 5. N.Y.

TONGS

Industrial Equipment Co., Minster, O.

TOOLS, CUTTING (Carbide)

Severance Tool Industries Inc., Saginaw, Mich.

TOOLS (Electric Portable)

Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.

TOOLS (Pneumatic Portable)

Chicago Pneumatic Tool Co., 8 East 44th St., New York 17, N. Y.
Dayton Pneumatic Tool Co., Dayton 1, O.
Dallett Co., 165 West Clearfield, Philadelphia, Pa.
Gardner-Denver Co., Quincy, Ill.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Schramm Inc., West Chester, Pa.

TORCHES and BURNERS (Acetylene, gas, oil)

Linde Air Products Co., 30 E. 42nd St., New York 17.
North American Mfg. Co., 4455 E. 71st St., Cleveland 4, O.

TOTE BOXES (see "BOXES-TOTE")

TRACTOR (Gas Powered)

Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.

TRADE ASSOCIATIONS

Crucible Manufacturers Association, 90 West St., New York 6, N. Y.
Gray Iron Foundres Society Inc., 1010 Public Square Bldg., Cleveland 13, Ohio.

TRAMRAIL SYSTEMS

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Modern Equipment Co., Port Washington, Wis.

TROLLEYS

Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis 20, Mo.
Modern Equipment Co., Port Washington, Wis.

TRUCK BATTERIES (Industrial)

Electric Storage Battery Co., Allegheny Ave. at 19th St., Philadelphia 3, Pa.

TRUCK CRANES

Hughes-Keenan Co., Mansfield, Ohio.
Silent Hoist & Crane Co., 885 63rd St., Brooklyn 20, N. Y.

TRUCK WHEELS

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

TRUCKS (Core Oven)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

TRUCKS (Power Lift)

Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.

TUBES (Annealing)

Pressed Steel Co., Wilkes-Barre, Pa.

TUBES (X-Ray)

General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.

TUMBLING BARRELS

Cleveland Chaplet & Mfg. Co., 1197 West 67th St., Cleveland 2, O.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
N. Ransohoff Inc., 208 W. 71st St., Cincinnati 16, O.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

TURNTABLES

Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Modern Equipment Co., Port Washington, Wis.
Newaygo Engineering Co., Newaygo, Mich.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

UNIT HEATERS

Dravo Corp., Dravo Bldg., Pittsburgh 22, Pa.

UNLOADERS (Portable-Gas Electric)

Cleveland Formgrader Co., 6723 Denison Ave., Cleveland, Ohio.

VALVES (Air, Water, Steam)

Air-Way Pump & Equipment Co., 1050 N. Kilbourn, Chicago, Ill.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Dallett Co., 165 West Clearfield, Philadelphia, Pa.
North American Mfg. Co., 4455 E. 71st St., Cleveland 4, O.

VALVES (Adjustable Orifice)

North American Mfg. Co., 4455 E. 71st St., Cleveland 4, Ohio.

VALVES (Blow-off and Cut-off)

Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Wm. H. Nichols Co., Richmond Hill, Long Island 18, N. Y.

VALVES (Oxygen, Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

VENTILATORS (Roof)

Swartwout Co., 18511 Euclid Ave., Cleveland 15, Ohio.

VENTILATING SYSTEMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.
Propellair Inc., Springfield, Ohio.
Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N.Y.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
Swartwout Co., 18511 Euclid Ave., Cleveland 15, Ohio.

VENTILATING SYSTEMS (Cont'd.)

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, O.
Westinghouse Electric Corp., B. F. Sturtevant Div., 40 Wall St., New York 4, N. Y.

VENTS (Core Box)

Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Demmler & Bros., Wm., Kewanee, Ill.
C. M. Smillie & Co., 1100 Woodward Hgts. Blvd., Ferndale, Mich.
Landis Mfg. Co., 2305 Hilton Rd., Ferndale, Mich.

VIBRATION REDUCTION PADS

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

VIBRATORS

Adams Co., Dubuque, Iowa.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Cannon Vibrator Co., 111 Power Ave., Cleveland 14, Ohio.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Davenport Machine & Foundry Co., Davenport, Iowa.
Dallett Co., 165 West Clearfield, Philadelphia, Pa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.
Nichols Co., Wm. H., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S P O Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Syntron Company, Homer City, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

VIBRATORS (Core Bench)

Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.

WASH ROOM EQUIPMENT

Bradley Washfountain Co., Box 732, Milwaukee 1, Wis.

WATER COOLERS (Electric)

Ebco Mfg. Co., 401 W. Town St., Columbus 8, Ohio.

WAX (Core, Vent, Pattern)

United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

WAX (Precision Casting)

Halowax Products Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

WEDGES (Foundry)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WELDING GAS

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING APPARATUS (Electric Arc)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Lide Air Products Co., 30 E. 42nd St., New York 17, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

WELDING and CUTTING APPARATUS and SUPPLIES

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING ELECTRODES (Carbon)

National Carbon Co., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.

WELDING RODS & ELECTRODES

International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WHEELBARROWS

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WHEELS, ABRASIVE (Cut-off)

Bay State Abrasive Products Co., Westboro, Mass.
Bridgeport Safety Emery Wheel Co., Inc., Stratford, Conn.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Independent Pneumatic Tool Co., Aurora, Ill.
Norton Company, Worcester 6, Mass.
Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit, Mich.
Raybestos Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio.

WHEELS (Wire)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

WIRE BENDERS

Redford Iron & Equipment Co., 21315 W. McNichols Rd., Detroit, Mich.

WIRE BRUSHES

Independent Pneumatic Tool Co., Aurora, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

WIRE CUTTERS

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Redford Iron & Equipment Co., 21315 W. McNichols Rd., Detroit, Mich.

WOODWORKING MACHINERY

Do All Company, Des Plaines, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Oliver Machinery Co., Grand Rapids 2, Mich.
Parks Woodworking Machine Co., 1546 Knowlton St., Cincinnati 23, Ohio.

X-RAY EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

X-RAY FILMS

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.

ZINC

American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.

—When writing advertisers, please mention THE FOUNDRY—

Classified Advertising

Help Wanted

MOLDING FOREMAN

Good opportunity for molding foreman with experience on sandslingers, jolts and squeezers. Must have a successful record in supervising molders. Should be able to organize and instruct employes in efficient operation of the various units to produce quality castings. Must have five or more years of supervisory experience in high production or semi-production gray iron or semi-steel foundry. Write experience in detail, listing size of shop, number of people supervised, type of work performed and references. Pennsylvania position. Address: Box 117, The FOUNDRY, Cleveland 13, Ohio.

SUPERVISOR

AN EXPERIENCED WORKING SUPERVISOR FOR MANUAL TRAINING SCHOOL FOUNDRY. MUST BE COMPETENT TO DIRECT AND TEACH ALL DEPARTMENTS IN GRAY IRON AND NON-FERROUS CASTING, SAND MIXING AND SAND LABORATORY WORK, CHARGING, MELTING, POURING, CLEANING ETC. STATE AGE, EXPERIENCE, PREVIOUS CONNECTION, SALARY DESIRED AND AVAILABILITY. SIZE OF CLASS 25 BOYS PER SESSION. ADDRESS: BOX 171, THE FOUNDRY, CLEVELAND 13, OHIO.

FOUNDRY SUPERINTENDENT

Nonferrous jobbing foundry employing about 60 men and handling all types of alloys, desires an experienced man capable of taking charge of molders and coremakers and supervising foundry operations. State qualifications, experience and salary expected in application. Address: Box 140, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEER
OR
FOUNDRY MANAGER

Qualified in modernization, foundry practice, methods and procedure. Must be college graduate and willing to travel. Four to five years' experience. Age 30 to 45 years. Address: Box 102, The FOUNDRY, Cleveland 13, Ohio.

SALES ENGINEER

Old established firm has opening for young engineer with foundry or foundry equipment sales experience selling top lines of foundry equipment in expanding Southwest area. Address: Box 989, The FOUNDRY, Cleveland 13, Ohio.

WORKING FOREMAN

Brass and aluminum foundry—3 molders—needs working foreman able to supervise workers. Good knowledge of foundry operation, top pay and bonus. West coast location.

BOX 144
The FOUNDRY CLEVELAND 13, OHIO

SALES REPRESENTATIVE

Established nonferrous foundry desires Sales Representative for Western Pennsylvania. Will consider salary and expenses or commission basis. Address: Box 129, The FOUNDRY, Cleveland 13, Ohio.

MOLDING FLOOR SUPERINTENDENT

Well established modern up to date steel foundry desires molding floor superintendent, man of Latin-American origin or American speaking Spanish preferred. Address: Box 151, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Brass Foundry Foreman. Address: AMERICAN BEARING CORP., 429 SO. HARDING ST., INDIANAPOLIS 7, IND.

Help Wanted

EXPERIENCED CORE ROOM FOREMAN

Capable of taking complete charge of core room which includes supervision, training employees, laying out the venting on core boxes for core blowers. Wonderful opportunities for the right man that is ambitious and wants to get ahead. State qualifications and salary desired in first letter. Address: Box 160, The FOUNDRY, Cleveland 13, Ohio.

WANTED

By gray iron foundry in Middle West, man for supervising of pouring off of medium and heavy gray iron castings. Must have experience also in operation of cupola. Write giving age, experience and salary desired. Address: Box 146, The FOUNDRY, Cleveland 13, Ohio.

MAINTENANCE MAN

Malleable iron foundry in Eastern section. Must have mechanical and electrical plant maintenance experience. To work as assistant to plant engineer. Write, giving age, marital status and full information on experience.

BOX 104
The FOUNDRY CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

For plant now employing about 200 men in Middle West. Age 35 to 40 preferred. Experienced in jobbing production of light and medium weight castings. Capable of rigging for production. Man with both pattern shop and foundry experience preferred. Address: Box 123, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Methods Engineer. Familiar with and experienced in foundry operations and work. Must have thorough knowledge of foundry practice and procedure, layout, machinery and manufacturing methods. Must be capable of engineering efficiently a job before incentive rates are set. Write in detail; education, experience, accomplishments and personal references. Address: Box #173, The FOUNDRY, Cleveland 13, Ohio.

ASSISTANT METALLURGIST

For iron roll foundry located near Pittsburgh, Pa. Prefer man 25 to 30 years old with metallurgical training and chemical laboratory experience. In reply state age, education and experience. Address: Box 101, The FOUNDRY, Cleveland 13, Ohio.

REPRESENTATIVE WANTED

Core Oil Distributor wanted in Detroit area by prominent manufacturer. Address: Box #176, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Capable of taking complete charge of foundry for an old established manufacturer manufacturing small brass castings on a production basis. Assured future and excellent opportunities for the right man. Please state experience, qualifications and salary desired in first letter. Address: Box 159, The FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN

For gray iron foundry currently employing about 70 people (capacity for over 100 people). Located in lower Michigan. Foundry produces light and heavy castings on jobbing floors; squeezers and rockovers. Applicant must not be over age 40 and must have unusually good qualifications. Excellent opportunity for advancement. Plant well equipped and company is strong financially with many years successful operation. Address: Box #177, The FOUNDRY, Cleveland 13, Ohio.

CHEMIST

To conduct core oil research in laboratory of large core oil manufacturer. Knowledge of foundry practice and core oil manufacture desirable. Address Box #183, The FOUNDRY, Cleveland 13, Ohio.

Help Wanted

FOUNDRY EXECUTIVE

Experienced man to assume complete management of gray iron jobbing foundry located in Cleveland. Now employing 30 molders. Opportunity to invest with privilege of buying out present owners at later date. Address Box #178, The FOUNDRY, Cleveland 13, Ohio.

FURNACE TENDER WANTED

Experienced Furnace Tender for permanent position with long established Brass Foundry, Southern California. Address Box #185, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRY MANAGER
OR
SUPERINTENDENT

Thoroughly experienced in ferrous and nonferrous and in all phases of foundry operation. Light to heavy work. Green and dry sand. Practical on molding and coremaking. Thoroughly experienced in cupola control. Well versed in grey iron metallurgy and foundry costs. Thoroughly experienced in production and executive capacities. Sales, contact and expediting experience. Neat appearing and pleasing personality. Employed as superintendent. Address: Box 887, The FOUNDRY, Cleveland 13, Ohio.

PATTERNMAKER

Thorough experience in wood and metal patternmaking. Interested in position as foreman in large shop or working foreman in small shop. Can estimate costs from blue prints, do layout work for pattern shop and also arrange for gates, risers and best method to mold in foundry. Experience on layout table and check work, small or large. Able to take over shop and run to show profit. Address: Box 134, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Twenty-eight years' experience as foundry superintendent. Practical molder. Understand cupola thoroughly. Prefer position with foundry making high grade castings. At present employed. Address: Box 122, The FOUNDRY, Cleveland 13, Ohio.

METALLURGICAL ENGINEER

Graduate metallurgical engineer, ten years nonferrous foundry practice and supervisory capacity for past seven years. Recent experience in permanent mould, plaster and investment casting. Familiar with radiographic and research problems. Background includes sales engineering experience and mould design. Address: Box #168 The FOUNDRY, Cleveland 13, Ohio.

FACTORY COST AND PERSONNEL MAN

Ten years' experience in cost control, office management and labor problems. College graduate, age 33, 4 years' payroll, cost control and industrial relations experience with present employer, a large foundry producing automotive castings. Further details upon request. Address: Box 143, The FOUNDRY, Cleveland 13, Ohio.

CORE ROOM SUPERINTENDENT

Twenty-five years' experience in all kinds of core making. Rigging for any kind of core room machinery and sand mixing for all types of cores. Address: Box 986, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

Desires connection with jobbing and production foundry. 30 years as molder and foreman. Now superintendent in foundry pouring 35 to 40 ton per day. Address: Box 912, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Positions Wanted

PATTERNMAKER

Patternmaker experienced wood and metal also foundry layout on pattern equipment would like obtain position in patternshop where foundry makes light iron or aluminum castings for small toys. About 2000 castings per day on squeeze machine. No core work but production work. Capable take over pattern work as foreman. Address Box 164, The FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY FOREMAN

Desires connection with progressive foundry. Practical molder and instructor on floor, bench and machine molding on brass, bronze and aluminum quality castings. Can control melting, gating and set up patterns for production. Green or dry sand. Also French sand molding. Address: Box 165, The FOUNDRY, Cleveland 13, Ohio.

MAINTENANCE SUPERINTENDENT

With engineering experience on mechanized foundry technical knowledge on layout, installation and estimating on foundry equipment. Twenty years practical experience in supervising complete maintenance in modern foundry. Excellent record handling men and foundry operation. Desire change. Address: Box #167, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Mechanical engineering graduate with 20 years' experience as plant manager and superintendent of plants producing high quality grey iron production and jobbing castings and production machining. Thoroughly familiar with all modern foundry equipment and methods. Successful in handling office and plant organization, labor and public. Address: Box 119, The FOUNDRY, Cleveland 13, Ohio.

ENGINEER

B.M.E., M. Met. E.—27—married—2 years' teaching in machine tools, shop work, metal processes, foundry and welding. One year experience in aviation and camera industries. Interested in production, sales engineering, advertising and technical writing. Address: Box 133, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

With several years' experience in malleable and grey iron foundries desires connection as customer contact man and soliciting new accounts. Malleable foundry preferred. Address: Box 121, The FOUNDRY, Cleveland 13, Ohio.

EXECUTIVE

Desires connection with progressive company. Age 45. Experienced as chief metallurgist, automotive plant, also production manager and at present works manager of alloy foundry. Experienced also in sales and service. Excellent references as to character and ability. Address: Box 112, The FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY FOREMAN

Desires connection with foundry in and around Cleveland or vicinity. Experienced in all types of brass, bronze and aluminum casting jobbing work, copper castings a specialty. Twenty-seven years' experience. Address: Box 154, The FOUNDRY, Cleveland 13, Ohio.

ALUMINUM PERMANENT MOLD FOUNDRY ENGINEER

TWENTY-FIVE YEARS' EXPERIENCE AIRCRAFT PARTS OR ANY INTRICATE WORK. FULL OR PART TIME. OHIO AREA OR METROPOLITAN NEW YORK LOCATION PREFERRED. ADDRESS: HAROLD C. HAASE, 557 SOUTH FOREST DRIVE, WEST ENGLEWOOD, NEW JERSEY.

Positions Wanted

GENERAL MANAGER

Mature, profit-minded, dependable. Has successfully managed four companies—two taken out of the red. Available for service shortly with medium-size company requiring reliable directing ability in management, sales finance and production. Excellent experience, foundry, machine and related lines. Address: Box 871, The FOUNDRY, Cleveland 13, Ohio.

FERROUS METALLURGICAL ENGINEER

Seven years' experience in steel foundry metallurgy; includes steel making, heat treating, laboratory testing, x-ray, welding, research, etc. Experience with steel forgings and weldments. Desires position in Northwestern, Western, Southwestern U. S., or in Canada. Married, B. Met. E. degree. Address: Box 153, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT—MANAGER

38 years of age, 18 years' practical gray iron experience. Ten years as general foreman and foundry superintendent. Good references. Address: Box 138, The FOUNDRY, Cleveland 13, Ohio.

PROBLEM SOLVER

Metallurgist would like to help you solve your foundry problems. Know all phases foundry work with experience in steel, stainless, malleable, gray iron, and some nonferrous except magnesium. Have worked with all departments from design to final inspection. Interested in improving quality, cutting costs through research and use of latest technical and engineering information. Job title immaterial. Middle West preferred. Address Box #186, The FOUNDRY, Cleveland 13, Ohio.

—YOUR PERSONAL MARKET—

THE CLASSIFIED ADVERTISING PAGES OF THE FOUNDRY ARE READ EVERY MONTH BY THOUSANDS OF FOUNDRYMEN. WATCH THEM FOR WHAT YOU ARE SEEKING. USE THEM TO GET WHAT YOU WANT. POSITIONS—HELP—EQUIPMENT.

FORMS CLOSE 13th OF MONTH.

FOUNDRY SUPERINTENDENT

Foundry Superintendent with several years experience in all branches of Malleable and Gray Iron would like to make connection with progressive foundry. Address: Box #184, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Practical foundryman with technical training. Thirty-two years experience, including fifteen years of supervision. Well versed in all phases of jobbing and production work on light and medium castings. Progressive and up-to-date in modern methods. Capable of taking complete charge of medium size foundry. Available on short notice. Address Box #179, The FOUNDRY, Cleveland 13, Ohio.

Foundry Consultant

ATTENTION: GRAY IRON FOUNDRIES

Get lower sulphur and hotter iron with less pig iron or no pay. New method of charging. Write for circulars. Address: HENRY MESSER, 1117 WILLOW AVE., SOUTH SAN FRANCISCO, CALIF.

Manufacturer's Agents

REPRESENTATIVES

Established Metal Abrasive Company wants representatives who sell direct to ferrous and nonferrous foundries and forge shops. Give particulars about your present setup and territory you can cover. Write us at once. Address: Box 124, The FOUNDRY, Cleveland 13, Ohio.

WANTED
EXCLUSIVE REPRESENTATIVES
STEEL AND ALLOY CASTINGS

To cover middle west and eastern territories. We are a modern, well established foundry producing steel and alloy castings for the past forty years ranging from ¼ pound to 10,000 pounds. Commission basis. Reply stating experience and references.

SWEDISH CRUCIBLE STEEL CO.
8561 BUTLER DETROIT 11, MICH.

SALES
REPRESENTATIVE

Industrial Furnace & Oven Sales Representation for Connecticut, New York and New Jersey wanted by mechanical engineer well established in the metal industry as Sales Representative with technical knowledge and experience in the heat treating, foundry and metal finishing fields. Address: Box 155, The FOUNDRY, Cleveland 13, Ohio.

REPRESENTATIVE WANTED

Manufacturer of foundry facings has opening for technical service type salesman who is well grounded in foundry practice. He will cover either Michigan, Ohio or Indiana territory. If record and experience indicates proper qualifications a personal interview will be arranged. Address: Box #180, The FOUNDRY, Cleveland, 13, Ohio.

Foundries For Lease

GRAY IRON FOUNDRY
FOR LEASE IN OHIO

Now operating under lease. Will be available soon. Good location. Good labor supply. Established over 75 years. Reasonable terms. Wonderful opportunity for good profits. Recent production 150,000 lbs. per month. Can be seen in operation now. Some improvements planned.

BOX 152
THE FOUNDRY CLEVELAND 13, OHIO

FOUNDRY FOR LEASE

Gray iron foundry for lease. 60 miles from Detroit. Ten squeezers, wheelabrator — all equipped. Address: Box 158, The FOUNDRY, Cleveland 13, Ohio.

Open Capacity

GRAY IRON CASTINGS

Open Capacity Available

Inquiries Solicited

TREDEGAR COMPANY

RICHMOND 11, VIRGINIA

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

Classified Advertising

Open Capacity

OPEN CAPACITY

Open capacity in grey iron foundry. Waterfronts—burners—bench, pumper and floor work. Address: P.O. Box 321, Belleville, Illinois.

FOUNDRY PRODUCTION WANTED

Manufacturer and distributor has complete line of patterns for production of hard iron stars. Want foundry to produce them for distribution by National Sales Organization. Address: Box 148, The FOUNDRY, Cleveland 13, Ohio.

OPEN CAPACITY

Have open capacity for production runs on sandslinger. Can make 10 to 40 castings a day weighing from 200 lbs. to 1000 lbs. Grey iron or semi-steel.

GENEVA FOUNDRY CORP.
23 JACKSON ST. GENEVA, NEW YORK
PHONE 6365

Accounts Wanted

ACCOUNTS WANTED

We specialize in ferrous and nonferrous castings. Our gross sales first half of 1948 over $2,500,000.00. Covering entire state of Ohio, Eastern Michigan and Western New York. Seven trained men employed regularly. Main office in Cleveland. Qualified to handle your sales exclusively on a commission basis. Any type of foundry interested address Box #181, The FOUNDRY, Cleveland 13, Ohio.

Opportunities

90 PER CENT OF THE CUPOLAS MELT UP TO ONLY 50 TO 60 PER CENT

capacity per hour—although the best and hottest iron is produced only when cupola is operated to its capacity. Report on your cupola may prove an eye-opener—usually the savings are surprising. Every pound of steel used in cupola mixtures reduces cost and increases strength 20 to 60%, because steel is purer than the most expensive pig iron. Watch the scrap pile—statistics prove casting losses can be held between 1 to 5% depending on the line of work. Our system is not an expense—but a valuable investment. Synopsis free.

McLAIN'S SYSTEM INC.
236 E. NORTH AVE.
MILWAUKEE, 12, WIS.

OPPORTUNITY

Sales representatives having foundry experience with wide following among foundries and industrial manufacturers in California are interested in acquiring additional, substantial non-conflicting lines. Commission basis only. Address: Box #169 The FOUNDRY, Cleveland 13, Ohio.

WANT TO RETIRE

Capable foundry manager is available to take over your business and protect your interests. He desires a permanent place in a foundry business and has money to invest.

BOX 142
THE FOUNDRY CLEVELAND 13, OHIO

OPPORTUNITY

New booklet on new method of cupola operation. Price $10. Money back if not satisfied. Worth its weight in gold for hand charging. One case: 35% coke, 20% melting time, 50% on cupola lining saved on regulation charging.

HENRY MESSER
1117 Willow Ave., So.
San Francisco, California

OPPORTUNITY

We can furnish at any point slack, fibre and tight barrels; also fibre and steel drums. Address: BUCKEYE COOPERAGE COMPANY, 3807 ORANGE AVENUE, CLEVELAND 15, OHIO.

Opportunities

OPPORTUNITY

For iron foundry to produce castings. We have a complete line of metal patterns for municipal and building castings. We want a foundry to produce castings for our distribution. Address: Box 149, The FOUNDRY, Cleveland 13, Ohio.

OPPORTUNITY

Desire to contact reliable and progressive concern to manufacture and market cast aluminum accessories for indoor-outdoor window gardens. Can furnish set of metal and master patterns which are easily molded. Will make unusual Christmas gifts. Minor shop operations. Write.

Edmund C. Hanley
215 Larch Ave., Muskegon, Michigan.

Employment Service

EMPLOYERS
SERVICE BUREAU
A SUPERIOR PERSONNEL SERVICE FOR DISCRIMINATING EMPLOYERS
ESTABLISHED 1922

Specializing in thorough screening of qualified personnel for any phase of foundry operations.

APPLICANTS

If you can furnish QUALIFIED references attesting to your CAPABILITY and DEPENDABILITY, your application will be accepted and we will secure for you the desired position, without cost. Our service is 100% FREE to applicant.

IMMEDIATE OPENINGS
Partial Listing

SUPERINTENDENTS	To $10,000
ASSISTANT SUP'TS.	To $7,200
GENERAL FOREMEN	To $6,000
CORE ROOM FOREMEN	To $5,200
MELTING FOREMEN	To $5,400
MOLDER FOREMEN	To $5,200
CLEANING ROOM FOREMEN	To $4,800
CUPOLA SUPERVISORS	To $5,200
SR. INDUSTRIAL ENGINEERS	To $7,200
JR. INDUSTRIAL ENGINEERS	To $3,900
TIME STUDY ENGINEERS	To $4,800
MASTER MECHANICS	To $6,600
PLANT ENGINEERS	To $6,000
METALLURGISTS	To $5,200
CHEMICAL ENGINEERS	To $4,800
CHEMISTS	To $4,200
PRODUCTION CONTROL	To $4,800
DESIGN ENGINEERS	To $6,000
SALES ENGINEERS	To $6,000
ACCOUNTANTS	To $6,000

If you are experienced in any phase of foundry operations—and desire to improve your future working conditions:

WRITE
EMPLOYERS SERVICE BUREAU
33 WEST WASHINGTON ST.
CHICAGO 2, ILL.
TELEPHONE: FINANCIAL 1155

SALARIED PERSONNEL

$3,000—$25,000. This reliable service, established 1927, conducts confidential negotiations for high-grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

SALARIED POSITIONS

$3,500—$35,000

If you are considering a new connection communicate with the undersigned. We offer the original personal employment service (38 years recognized standing and reputation). The procedure, of highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details.

R. W. BIXBY, INC.
101 DUN BLDG. BUFFALO 2, N. Y.

Foundries For Sale

CALIFORNIA FOUNDRY
IDEAL CLIMATIC CONDITIONS

One of the largest privately owned iron foundries in the State. $40,000 will buy entire set-up. Owner will give long term lease on new buildings and 2 acres land at $400.00 per month. Located in thriving San Joaquin Valley mid way between Los Angeles and San Francisco. Only experienced Foundry men need apply. Contact owner for further particulars.

WRITE, PHONE OR WIRE
WM. E. HOWE
TULARE FOUNDRY TULARE, CALIF.

FOR SALE

Modern gray iron foundry within 100 miles of New York. A steady, profitable business priced exceptionally low.

EDWARD H. ZOLL
Industrial Properties throughout the East.
790 BROAD ST. NEWARK 2, N. J.

FOR SALE OR LEASE

Non-ferrous foundry 50 miles south of San Francisco, going, well established business, 1000 pounds hourly melting capacity; three molding machines and three U-roller conveyors, steel molding benches, Royer sand conditioners, band saw, grinder, cut-off wheels, sand blast room 30 x 30, sand blast tumbler, Sterling Flasks, two overhead cranes; fully equipped core room, core machine, core oven. 2/3 acre choice corner location. Building and equipment like new. Priced at $70,000.00. Owner retiring. Address: Box #172, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

Machine—welding shop in Western Wisconsin. Railroad siding. Excellent for small manufacturing plant or custom work. Reasonable price. Address: Box 157, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Gray iron foundry, Northeastern Oklahoma. Operated continuously since 1910. Fully equipped, leased rail siding, pattern coke and sand storage. Doing good business. Address: Box 840, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

Nonferrous foundry, San Francisco bay district, capacity large enough to employ 50 men. Address: Box 150, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

Grey Iron Foundry
15 ton capacity daily
Excellent buy.

152 WEST WISCONSIN AVE. ROOM 410
MILWAUKEE, WIS.

NONFERROUS FOUNDRY

Three miles from Chicago's Loop. 4300 square feet of floor space. Room for expansion available. 2 Jolt Squeezers, etc. $5600.00 full price. Address Box #182, The FOUNDRY, Cleveland 13, Ohio.

Open Capacity

OPEN CAPACITY

Gray Iron Foundry with jolt and squeeze production machinery for casting work weighing up to 30 pounds. Have capacity open at present of 5 tons per day.

BILLARD MACHINE & TOOL CO.
Mansfield, Penna.

Classified Advertising

Wanted-To-Buy

WANTED

Two air jolt hand strip molding machines, 13" x 18" flask size. Wire, write or telephone:

T & W MFG. CO.
1529 CRYSTAL AVE. KANSAS CITY, MO.
PHONE—BENTON 0987

WANTED

1—Used plain jarring or jolt machine, Osborn or Herman Pneumatic preferred, 66" x 96" table plate, 20" cylinder, 15,000# capacity at 80# air pressure, for foundry service.

NATIONAL RADIATOR COMPANY
PURCHASING DEPARTMENT
JOHNSTOWN, PA.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

WANTED
ELECTRIC FURNACE

One 500 or up to 1000 pound cold melt electric furnace with or without transformer equipment. Give complete information as to size, age, condition, etc. Address: MID WEST FOUNDRY, INC., 1725 SHERIDAN AVE., SAGINAW, MICH.

WANTED TO BUY

Sandslinger with 8' Arm and 4' sling arm. Please give complete information, exact size, condition and price. Address: Box #175, The FOUNDRY, Cleveland 13, Ohio.

CUPOLA WANTED

WANTED—A SMALL CUPOLA COMPLETE WITH BLOWER FOR MANUAL TRAINING SCHOOL FOUNDRY. SHELL NOT OVER 30 INCHES IN DIAMETER. GIVE CONDITION AND ACCURATE DESCRIPTION. BLOWER CAPACITY AND HORSE POWER. MELTING RATE AND PRICE F.O.B. CARS.

ADDRESS: BOX 170, THE FOUNDRY
CLEVELAND 13, OHIO.

WANTED

Osborn Model N-560-561 Cope Machine. Please wire.

OHIO FOUNDRY COMPANY
9812 Quincy Ave., Cleveland, Ohio
Phone—CEdar 5500

For Sale

FOR SALE

Several 5" Adams Wood Slip Flasks—various sizes.
90 Gray Iron Jackets—various sizes.
1—48" square x 84" long Tumbling Mill, belt driven.
1—No. 10 SE-2 Milwaukee Jolt Squeeze Molding Machine.
1—8" Milwaukee Squeezer.
1—Robins Flotex shakeout unit 4' x 5'—heavy duty.
6—Robins Model 30-40 Flotex shakeout unit, 2000 lb. capacity.
2—#2 Simpson Sand Mullers.
2—Osterholm Grinders.

Detailed list on Request

OLIVER CORPORATION, Plant #1.
533 So. Chapin St.,
South Bend 21, Indiana.

ROTOBLAST FOR SALE

Pangborn No. 28, Type G. K., capacity 28 cu. ft., complete with loader, abrasive reclaimer and spare parts. New 1942—in service when taken out. Price for machine and parts very attractive—slightly more than value of spare parts alone. Address Box 163, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

One ton per hour, 2 ton charge, side charger, electric furnace, transformers, panel boards. Excellent shape.

TAFT ALLOY STEEL COMPANY
TAFT, CALIFORNIA

For Sale

FOR SALE

MOLDING MACHINES—

1—Tabor Split Pattern Jolt Squeeze Air Operated, Serial 20867.
1—Tabor Split Pattern Jolt Squeeze Air Operated, Serial 19097.
1—Tabor Split Pattern Jolt Squeeze Air Operated, Serial 19265.
1—Tabor Split Pattern Jolt Squeeze Air Operated, Serial 18458.
1—Tabor Jolt Squeeze, Yoke type, 13" x 18", Air Operated, Serial 27139.
1—Tabor Split Pattern Jolt Squeeze, 13" x 18", Air Operated, Serial 20363.
1—Osborn #42, portable, rollover, Air Operated, Serial 10377-D.
1—Osborn #42, portable, rollover, Serial 10377-B.
1—Tabor 10", Special Shockless Jar Squeezer, (end. brg. mch.) Serial 25086.
1—Tabor 10", Special Shockless Jar Squeezer, (end. brg. mch.) Serial 25085.

SAND HANDLING SYSTEM—

Link Belt Conveyor for sand distribution 18" x 105' with ten 21" x 7" plows, 10 steel hoppers 24" x 18" x 60" and plank walk 2' x 120'.
Motor for above 3 hp. G/E 1720/60/220/440, with chain drive to reducer unit.
Link Belt conveyor for shakeout 18" x 110'.
Motor for above 3 hp. G/E 1800/3/60/220-440 direct connected to reducer unit.
Link Belt Conveyor (crossover in pit) 18" x 7' cc.
Motor for above 1 hp. G/E 1130/3/60/220-440.
Link Belt Conveyor 18" x 12' cc.
Motor for above 2 hp. G/E 1740/3/60/220-440 direct connected to reducer.
Screen, Hopper Type, 3' x 8'.
Motor 3 hp. G/E 1720/3/60/220-440, V Belt Drive.
Elevator, Bucket Type, 12" x 35' rubber belt.
Motor for above 5 hp. G/E 1735/3/60/220-440 direct connected to reducer.
Link Belt Conveyor 18" x 25'—motor driven. F64.
Elevator, Bucket Type 12" canvas belt 34' cc.
Motor for above 5 hp. G/E 1800/3/60/220-440, chain drive.
Link Belt Areator, mill type 8'-6", 1x1'-6", wX36"h.
Motor for above 5 hp. G/E 1150/3/60/220-440, V Belt drive.
Sand Storage Bin 60 ton.
Jeffrey Areator with 7½ hp. motor.
Revolving Screen 4' diam. with gear reducer.

MISCELLANEOUS EQUIPMENT—

Simpson Sand Mixer, lab. type for core sand, complete.
Simpson Sand Mixer #2 with 20 hp. motor.
Ball Mill, Marcy #32 with Wilfley concentrating table. #11-0 & 10 hp. motor.
Riddle, Combs Gyratory 18" diam. with 1/6 hp. motor 860/3/60/220.
Riddle, Combs Gyratory 20" diam. with 1/6 hp. motor 860/3/60/110.
2—Sprue Cutter, Tessmer ⅜" sq. Model H, less motor.
Sprue Cutter, 14" throat "Benj. Middleton" with motor.
Monarch 300# Crucible Tilting Furnace, with mechanism, less motor.
10—Bohn Oil Fired Brass melting furnaces, pit type, for No. 80 crucible.
3—"Standard" Snagging Grinders, double end, 18" wheel.
Lathe, engine—for boring core boxes, less motor, tailstock and cross slide.
2—Motors G/E 1/3 hp. 3/60/220.
3—Motors G/E ½ hp. 3/60/220.
1—Motor G/E 1/6 hp. 3/60/220.
Blower, G/E low pressure 32 oz. 1600 CFM with 20-24 hp. motor 3600/3/60/440.
Motor, 25 hp. 1200/3/60/220-440—need rewinding.
North American Blower, 160 oz. 275 CFM with 2 hp. motor G/E 3450/3/60/220-440.
"Spencer Turbo" Blower 16 oz. 250 CFM with 2 hp. motor G/E 3500/3/60/220-440.
Mathews Roller Conveyor 60' x 16" high roller 6" cx 2½" rolls, ball bearing with stand.
Mathews Roller Conveyor 210' x 16" low roller 6" cx 2½" rolls, ball bearing with stand.
286 Steel Squeezer Flasks 12" x 18" cope & drag.
463 Tabor flasks 12" x 18" cope & drag.

(Cont'd. top of next column)

For Sale

1 Snap Flask 10" x 20" cope & drag.
1 Snap Flask 14" x 19" cope & drag.
2 Snap Flasks 14" x 16" cope & drag.
1 Snap Flask 13¾" x 18¾" cope & drag.
1 Snap Flask 14" x 14" cope & drag.
1 Snap Flask 12" x 20" cope & drag.
1 Snap Flask 12" x 22" cope & drag.
944 Bottom Boards (wood) 12" x 18".
50 Bottom Boards (wood) 13¾" x 13¾".
150 Bottom Boards (wood) 11¾" x 21¾".
268 Bands for 12" x 18" snap flasks.
34 Squeezer Flask uplifts.
448 Flask weights.
3 pr. Crucible Tongs for No. 80 crucible.
3 Core Setting Tables (revolving).
4 Carrying Shanks for No. 80 crucible.
1 Time Meter G/E mod. 8KT 2a-26, 460v/60 cy.
1 Pump control-low water cutoff or alarm, "McDonald Miller" #152.

BOHN ALUMINUM & BRASS CORPORATION
Purchasing Department—Detroit, Michigan

FOR SALE

Tabor Rollover Molding Machine, power draw, 12" lift.

Clearfield Sand Mixer, Model 404s, #125.

Bickford Drill Press.

Two—one ton Electric Hoists with Monorail and Power Drive.

Johnston & Jennings Molding Machine, 36 x 36.

Cleveland Planer 18' Openside.

THOMPSON FOUNDRY & MACHINE CO.
THOMASVILLE, GA.

FOR SALE

No. 372 Besly 53" vertical spindle disc grinders, including radial arm truing device and V-sheave on spindle, but less motor, belts and controls. Equipped for dry grinding but can be changed for wet. Net weight—6820 lbs. $1250

No. 208 Besly 23" and 30" single spindle disc grinders with wheel guards and geared lever feed tables. Furnished with or without new motor drive. Net weight—3240 lbs. 23".. $600

30".. $700 (Prices without motors)

Grinding Wheels for use on the above machines, Norton, Besly and Gardner, size No. 16 grain for cast iron and refractory grinding in stock. Have substantial saving to offer on wheels we have in stock.

All grinders guaranteed in first class condition, having seen very little use. We will ship on open account, subject to inspection at destination, to firms of approved credit. All prices are net, f.o.b. Shreveport, Louisiana.

FREDERIC & BAKER

826 ARDIS BLDG. SHREVEPORT 91, LA.

FOR SALE

1—18" x 25" Roots-Connersville positive pressure blower with 125 H.P. motor.
1—Motor operated Butterfly valve.
4—3 Ton Whiting steel converter shells with 2 tilting assemblies.
1—Champion 48" x 48" x 8" draw power flask push-off machines.
1—Osborn Jolt, rollover, draw molding machine.
5—Osborn Jolt strip molding machines.
2—Nichols Jolt, squeeze molding machine.
1—Nichols Jolt table.
2—Osborn Jolt, rollover squeeze molding machine.

GUNITE FOUNDRIES CORP.
ROCKFORD, ILL.

Classified Advertising

For Sale

EQUIPMENT FOR SALE

MOLDING MACHINES

4—#815-B Johnston & Jennings jolt-rollover-draw 30" x 40" table, 15" draw.
3—75J Osborn Jolt Squeeze
2—SPO #611-B Stationary Oscillating Squeeze Strippers
1—SPO #4½ JHS Air Jolt Hand Strip
1—Tabor Plain Squeeze, Strain Rod Type
3—Mumford 3" Cyl. Core Jolt, with 20" x 15" Table

BLOWERS FOR CUPOLAS AND FURNACES

6—#806 General Blowers, 5 HP, 3/60/220, 1400 CFM at 8-oz. pressure
Maxon-Premix Blowers for Gas, ⅛ to 1 H.P.

METAL MELTING EQUIPMENT

1—Recirculating Gas Fired Oven with all controls, suitable for Core Oven
2—Hausfeld 1000# Aluminum Capacity Furnaces, Barrel Type, Open Flame, Oil Fired
2—Hausfeld 2000# Aluminum Capacity Furnaces, Barrel Type, Open Flame, Oil Fired
1—Aluminum Electric Heat Treating Unit, 75 KW, 220 Volt, Batch Type, with Basket and Quench Tank
3—Stationary Gas Fired #60 Crucible Furnaces, with ¼ H.P. Maxon-Premix Blowers
2—Monarch-Rockwell Rotating, 500# Brass. Oil New 32" to 41" Dia. Shell Cupolas made to order

TUMBLING MILLS AND SAND BLAST

1—Pangborn #2 Barrel, Suction Feed, Motor Drive, Complete
1—American Foundry Equipment Co. Stationary Cabinet Type Wheelabrator, complete with Elevator and all Motors
1—American Foundry Equipment Co. Wheelabrator, 45" Dia. Table, Complete with Motors
2—Pangborn No. 2 GH direct pressure type sandblast barrels, motor driven. Complete units.
1—Pangborn LE 6 ft. sandblast table, continuous sand feed, motor driven. Complete unit.
1—Pangborn LE 4 ft. sandblast table, continuous sand feed, motor driven. Complete unit.
3—Pangborn type AV direct pressure sandblast generators. Sand capacity 650#.
1—Pangborn Sand Blast Unit including generating tank, shot cleaner, bucket elevator and dust collector with motor. Suitable for use with room.

1—Mono-Rail System Complete with approximately 1200 ft. of track, 74—250# capacity 110 Volt hoists, two and four wheel trolleys, switches, 35—2000# 20 ft. bridges, and all necessary parts to install.

MISCELLANEOUS

1—American sand cutter model "AM", size 74-50; 3/60/220 electric motors.
4—Heavy duty flexible shaft grinders 2 HP
30—Jib Cranes, Floor Type, 1000 to 4000 lbs. capacity, 180° swing, 10 to 15 ft. arms
30—1000 lbs. Capacity Budget Electric Hoists
5—Sturtevant Dry Type Dust Collector Exhausters, 12500 CFM with 25 H.P. Motors
5—Low Lift Electric Trucks, 2000 lbs. capacity and up. Riding Operator Style
1—Heavy Duty Back Geared Sprue Cutter, 1⅛" square knives, T & L Pulley Drive
6—Worm Geared Tilting Ingot Mold Stands, 6' to 12' Long
1—Sly 10' x 28' x 7' Sand Blast Room complete with mechanical shot handling and four 5-Ton cars.
Miscellaneous Electrical and Gravity Conveyor Systems

CLIFTON MACHINERY CO.
1023 W. 6th ST. CINCINNATI 3, OHIO
PHONE PARKWAY 7812

For Sale

FOR SALE

OVERHEAD ELECTRIC TRAVELING CRANES

Tons	Make	Span	Current
5	Northern	21'0"	230-VDC.
5	Northern	25'0"	230-VDC.
5	Milwaukee	50'0"	230-VDC.
10	Northern	37'10"	230-VDC.
5	Milwaukee	60'0"	220-VAC.
25	Alliance	55'0"	230-VDC.

ELECTRIC MONORAIL HOISTS

QU.	TONS	MAKE	CURRENT
7	½	Lo-Hed & Shepard	230-VDC.
1	1	Shaw-Box	220-VAC.
1	2	Shepard	230-VDC.
1**	2	Shepard	220-VAC.
1*	2	Shepard	230-VDC.
3*	3	Lo-Hed	230-VDC.
1*	5	Lo-Hed	220-VAC.

*—2-Motor, Fl. Op. **—2-Motor, Cg. Op.
ALL ABOVE IN STOCK OFFERED REBUILT & GUARANTEED
SEND FOR OUR STOCK LIST OF A.C. & D.C. GENERAL PURPOSE CRANE & MILL MOTORS, ELECTRIC BRAKE & CONTROL EQUIPMENT, MOTOR GENERATOR SETS, TRANSFORMERS, ETC., OF ALL SIZES.

T. B. MACCABE COMPANY
4300 CLARISSA ST.
PHILADELPHIA (40), PENNA.

TURBO BLOWERS

2100 cfm @ 10 oz, Spencer, with 10 HP, 220/440 V. 3/60/3600 RPM motor.
(4) 675 cfm @ 6 oz., Spencer, driven by 2 HP, 220/440 V., 3 ph. 60 cycle 3600 RPM.

PRESSURE BLOWERS

1600 cfm @ 2 lb. General Electric with 20 HP, 3/60, 3600 RPM motor.
1400 cfm @ 8 oz. Robinson with 5 HP, 3/60, 3600 RPM motor.
1100 cfm @ 16 oz. Sturtevant
800 cfm @ 24 oz. American with 10 HP, 3/60, 3600 RPM motor
500 cfm @ 14 oz. McKee, with 5 HP, 3/60, 3600 RPM motor.

HOISTS

¼ Ton—Detroit Titan—440/3/60
¼ Ton—Budget—220/3/60
¼ Ton—Comet—440/3/60
¼ Ton—Shepard—220 D.C.
½ Ton—Chisholm Moore—440/3/60
½ Ton—Cleveland—440/3/60

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND 14, OHIO

FOR SALE

Swing Frame Portable Grinder "Marschke" 3 speed, 16" x 3" complete with new wheel. 7½ HP 220V 3P 60 C.A.C. motor with V belt drive and full belt guards. Not used 60 days.

STEDMAN'S FOUNDRY & MACHINE WORKS, INC.
AURORA, INDIANA

FOR SALE

CORE RODS

51000#—5/32" Rd. M.S.—14"
54000#—5/16" Rd. M.S.—14"

IRON & STEEL PRODUCTS, INC.
43 YEARS' EXPERIENCE
13444 S. BRAINARD AVE., CHICAGO 33, ILL.
"ANYTHING containing IRON or STEEL"

ELECTRIC FURNACE

Northwest Firm can ship on 5 day's notice a used ¾-1 ton Green Electric Furnace. Furnace is complete with 600 KVA 12 K.V. primary furnace transformer with 3 secondary voltage taps arranged for manual switching, automatic electrode control with motor generator set. Also includes primary disconnect and circuit breaker. Reason for sale, steel foundry discontinued.

BOX 131
THE FOUNDRY CLEVELAND 13, OHIO

For Sale

FOR SALE

Schutte & Koerting tumbling and washing barrel	$395.00
Nichols portable jolt strip molding machine, 26" x 27" table	275.00
International portable jolt strip molding machine, 16" x 30" table	150.00
Tabor stationary jolt squeeze molding machine, 16" x 16" table	150.00
Roller conveyor, ball bearing, almost new, random lengths, 8 to 10 ft. Per ft.	3.50
Osborn jolt squeeze molding machine, 14" x 18" table	165.00

BILLARD MACHINE & TOOL CO.
PHONE 44 MANSFIELD, PA.

EQUIPMENT FOR SALE

12,000 Ga. Steel Tank.
42" Schwartz Brass Melting Furnace—one extra lining.
#2 Baird Tilting Tumbling Barrel.
30" Allen Turbine Ventilator.
Van Dorn Electric Grinder—Suspended Type 1-1/3 hp motor.
Kinney Oil Pump—mounted on base with speed reducer. Type SD-311.
American Red Flash Heating Boiler—900' radiation.
Fairbanks-Morse Stoker—90 lbs. per hour.
Corrugated Asbestos Sheets—approx. 1100 sq. ft. in 6' and 7' lengths, 27½" wide x ¼" thick.

BECKETT BRONZE COMPANY
Muncie, Indiana

STEEL TUBING—FOR SALE

188,000 Lbs. 4.895" O.D. x 1.073" Wall, 36⅝" lengths, New Tubing. SAE 4340.

Immediate Delivery.

GLAZER STEEL CORPORATION
2100 AILOR AVENUE
KNOXVILLE, TENN.
PHONE 4-8601

FOR SALE

Complete modern sand-handling system, nineteen hoppers; speed mullers; sand storage bins; conveyors; magnetic separator. Sand distribution system engineered and manufactured by Link Belt Co. Slightly used. Address: Box 156, The FOUNDRY, Cleveland 13, Ohio.

LATE MODEL EQUIPMENT
PRICED TO SELL

International Type Y.O.L. Molding Machine (4)

International Type R.E.P. Rollover Machine, Power Air Clamp (5)

Upender Unit

International Air Jarring Machine (8)

HARVEY GOLDMAN & CO.
9656 French Road, Detroit, Michigan
Phone—Walnut 1-1151

Classified Advertising

For Sale

FOR SALE

1—#559 Osborn jolt stripper moulding machine.

1—#444 Osborn jolt rockover pattern draw moulding machine.

Both machines new, have never been used.

SCHILL MANUFACTURING COMPANY

CRESTLINE, OHIO

FOR SALE

1—Whiting cylindrical ladle, 1350 lbs. capacity, with lining, ladle used but once.

1—500 lb. capacity, cylindrical ladle with lining, roller bearing trunnions, #1 type shank, detachable bail with crane hook eye, ladle used but once.

FAIRMOUNT FOUNDRY INC.
HAMBURG, PA.

FOR SALE

Hardinge conical ball mill complete with motors, bucket elevator, screw conveyor, switches and magnetic chuck. Never used.

DARIN & ARMSTRONG, INC.
2041 FENKELL AVE. DETROIT 3, MICH.
UNIVERSITY 2-3413 J. B. BENJAMIN

FOR SALE

New heavy duty motorized rod cutter, 65 cuts per minute; capacity: ¾ inch round hot rolled steel. Brand new, $890.00 f.o.b. Cleveland. Address: The Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

SAND BLAST MACHINES

We have in stock three brand new complete portable sand blasting machines 100 pound, 350 pound and 650 pound capacity in sand. Can be used with steel grit also. New "Sanstorm" type, non-clogging design. Ideal for auto body shops, foundries, heat treaters, painters and forge shops. We also have in stock for immediate shipment a #22 Moline portable molding machine (brand new) also a used belt drive tilting tumbling barrel.

FEDERAL FOUNDRY SUPPLY COMPANY
4600 EAST 71st ST. CLEVELAND 5, OHIO

FOR SALE

1—Jeffrey SF portable sanditioner, type P with 2 HP motor, 3 phase, 60 cycle 220 volt. Address: Box 983, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

2—LADLES, 3 ton steel capacity, standard open straight sided geared, with square bail frame, bowl 43½" diameter by 43½" high, on original skids, manufactured by Modern Equipment Co., $525.00 each, f.o.b. Philadelphia, Pa. Address: STECHER STEEL CO., PHILADELPHIA 32, PA.

FOR SALE

TURBO COMPRESSOR
CUPOLA BLOWER

Used one year, 1# pressure, #3 discharge with one 16" blast gate motor, 30 H.P., 1750 R.P.M., 220-440 V, 3 phase, 60 cycle for $1400.00. Immediate delivery.

PRODUCTION PATTERN & FOUNDRY CO.
BOX 299 CHICOPEE, MASSACHUSETTS

For Sale

SPECIAL SALE

1—24 x 60 Sly Tumbling Barrel

1—32 x 60 Sly Tumbling Barrel

1—40 x 60 Sly Tumbling Barrel

1—#91 Osborn Coreblower, practically new

3—Modern Timken Roller Bearing Crane Ladles, 41" deep, 42" diameter, 41" bottom—Teapot Spout

1—Lancaster Sand Mixer

HAYNES FOUNDRY EQUIPMENT CO.
814 Ada St. Kalamazoo 52, Michigan

FOR SALE

1—40 x 58 Herman jarr molding machine, complete serial 2552. Address: Box 963, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

6000 Tons Ingots—Open Hearth poured to any size and chemistry, .09 carbon and higher. Immediate delivery—Price $118.00 per net ton delivered any point in the East or Middle West. Address: Box #174, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

#610 Clearfield Muller, w/loading hoist.
Royer Sand Separator and Blender.
Simplicity shakeout 48 x 72, w/elevator and hopper.

FALK MACHINERY COMPANY
18 WARD ST. ROCHESTER, N. Y.

FOR SALE

90—Sets of used 12" x 14" to 18" x 24" Hines Pop-Off Flasks.
30—Sets of used 16" x 21" Shanafelt Flasks.
2—Osborn #42 Core Blowers.
2—Tabor Rollover Molding Machines.
1—Osborn #321 Jolt Squeeze Rollover Molding Machine.
1—Davenport #24-SA Rollover Molding Machine.
1—Osborn Rollover Core Machine.
7—Milwaukee #1439 Jolt Squeeze Molding Machines—Air Operated.
Note: All machines purchased new in 1944.

D. E. DONY MACHINERY CO.
47 LAURELTON ROAD
ROCHESTER 9, NEW YORK

FOR SALE

One 42 x 48 Skip Hoist Loader for American Wheelabrator complete with motors, ready to use. Good condition. Price $500. Address Box 162, The FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

Two foundry shakeouts, 3 x 5-foot Simplicity with TEFC motors (G.E.); good condition, slightly used; priced to sell. Address: P.O. Box 55, East Detroit, Mich.

FOR SALE

Stroman #60-80 Stationary Furnace—push-back cover, gas fired with 36" adjustable orifice valve.

ATLAS GLASS & MIRROR CO.
1910 W. Webster Ave., Chicago 14, Ill.

FOR SALE
AND
IMMEDIATE SHIPMENT

1—No. 8 Sly centri-blast revolving table—Steel shot or grit blasting machine complete with motors and starters.
Used but in good operating condition. Price on request.

MASCOT STOVE CO.
CHATTANOOGA 2, TENN.

FOR SALE

2—Model HS Hough Payloaders thoroughly rebuilt, about 2 years old. Price each f.o.b. our warehouse Rock Island, Ill. $1650.00.

A. E. HUDSON COMPANY
11th St. & 51st Ave., Rock Island, Ill.
Phone—RI 7252

FOR SALE

25 Tons Spiegel Iron.

1 #602 Osborn Rollover Molding Machine—good condition.

ADDRESS: BOX #166, The FOUNDRY
Cleveland 13, Ohio.

FOR SALE—TWO AIR COMPRESSORS

Practically new, late type compressors still in operation. Reason for selling, going out of business. Specifications:

#1 Ingersoll-Rand—15½ and 9½ x 10 XCB-2 air compressor with General Electric 125 H.P. 3 phase, 60 cycle, 870 rpm motor complete with tank, water cooled after coolant, actual free air delivery 639 CFM.

#2 Sullivan—Class WN-112-E, Size 11¼—7 x 7 "V" Vertical, heavy duty, water cooled air compressor complete with built-in wound rotor induction motor, manual starter and primary switch, air filter, speed 585 rpm, piston displacement 468 CFM, actual delivery 398 CFM.

Also other foundry equipment for sale.
Wire or Wire

Globe Foundry, Attention: Mr. O. Leach,
387 Charles St., Providence, R. I.

FOR SALE

2—Slightly used J & J No. 681-C Portable Jolt-Strippers, table size 24 x 30", 8" pattern draw, 600# jolt capacity.
3—Used Hones AM-200 BUZZER Aluminum Melting Furnace, 200# capacity.
2—Used Stand Grinders. Each handles two 16" dia. 1½" bore wheels, 42" from center to center; 33" from floor. Equipped with 5 HP G.E. 1750 rpm. 220 volt, 3 phase motors.

FOUNDRY SUPPLY CO., INC.
404 SOUTH THIRD ST.
MINNEAPOLIS 15, MINN.

FOR SALE

1 Royer Type NC2-46 machine with iron wheels.
2 Model S; B & P Screenarators—rubber wheels.
2 Osborn Jolt Squeezers, Type 275-J.
3 Foundry Type Cab Operated Shepard-Niles Cranes, 5 ton capacity, 27' 3" span—Motors 230 DC; like new.
1 Gardner-Denver Air Compressor, new in 1945; Size 6½ x 5½—Cap. Actual air 130 ft. at 125 lb. "V" belt drive—mounted on base with 30 hp motor.
Send us your inquiries on any foundry equipment.

RAY P. SCULLY,
SCULLY MACHINERY & EQUIPMENT CO.
(Not Inc.)
767 Milwaukee Ave.
Chicago 22, Ill. Phone: Canal 0314

Classified Advertising

For Sale

FOR SALE—FOUNDRY EQUIPMENT
Miscellaneous used foundry equipment consisting of circular type annealig furnaces, air hoists, plain jolt molding machines, core oven, sulky ladle, motors, etc. At favorable prices.
KELLY FOUNDRY & MACHINE CO.
Elkins, West Virginia

FOR SALE
ROTARY POSITIVE BLOWERS

Sutorbilt—2520 Connersville—

11 SB	20 NS	600 vert.
35 NS	60 RB	8x12 SD
17 B	60 NS	8x15 HD
40 NS	615 HD SB	8x20 HD
40 OS	615 NS	8x20 B
47 SB	60 OS	8x20 RS SD
47 OS	60 SB	10x12 vert.
315 AF		12x18 HD gas pump
20x30 HDRS		16x21 HD gas pump
16x24 HDRS		
14x36 10 FT		20x30 SFH
12x30 6 FT		10x18 SD

Roots Acme—
#1 blower #1 gas pump #4½ OS
#3 gas pump #5 NS blower #3 blower
Stewart—
#3 #4 #5 blowers
Roots Connersville—

33 AF	59 SB	50 OS
44 AF gas pump	50 NS	25 NS
44 AF blower	50 BNS	615 AF

42 AFS 3 HP, 1160 RPM, 3/60/220
53 AFS 5 HP, 870 RPM, 3/60/220
28x30 HDRS with 17x20 Skinner Universal Uniflow Steam Engine
Pottstown—

3½x5	10x21 RB
5x15 ball bearing	10x21 HD RB
8x21 RB	

Roots—

4½ NS blowers	½
4½ NS gas pump	5 SB
4½ SB	

HIGH TEMPERATURE FANS
MIH30 Thermo-Industrial Gas Eng'g Co. 1250°F.
40 S.S. Garden City—High Temperature

PRESSURE FANS

00 Buffalo.	0 Sturtevant.
2EH Buffalo.	3 Sturtevant.
1 Champion.	1P American.
4E Buffalo.	4 Sturtevant.

MULTIBLADE
No. 9ME New York ¾ H.P. 1725 RPM.
No. 2 Garden City, 12" Inlet.
No. 2 American, 12" Inlet.
5BC Buffalo, 14" Inlet, 3 H.P., 1730 RPM.
1¾ Clarage, 15" Inlet.
2½ American, 15".
2½ Buffalo, Limit Load.
3 American, 18" Inlet.
3½ American, 21" Inlet.
2½ H.Y. American, 34" Inlet.
36 ME New York, 40" Inlet.
7 Niagara Conoidol Buffalo, 40" Inlet.
6½ Limit Load Conoidol Buffalo DIDW.
8 Bayley Plexiform.
2½ Clarage HV.
5½ Buffalo Turbo Conoidol.
2¼ Clarage HV.
5 American Sirocco.

BACKWARD CURVE
3½ AHS American, 21" Inlet.
75 Silentvane Sturtevant.
4½ AHS American, 27" Inlet.
85 Silentvane American, 36" Inlet.
9 A.H.S. American, 61" Inlet.

STEEL PLATE
4V American, 9" Inlet.
17 New York, 11" Inlet.
25 American, 11" Inlet.
5V American, 10½" Inlet.
25E Clarage, 11" Inlet.
30E American, 13" Inlet.
13E Clarage, 13" Inlet.
15LS Clarage, 14" Inlet.
15E Clarage, 15" Inlet.
35E American, 15" Inlet.
400 ELS American, 16½" Inlet.
40 E American, 17" Inlet.
40 EX Bayley, 17" Inlet.
7 KP Pangborn, 18½" Inlet.
40 Slow Speed Sturtevant, 20½" Inlet.
80 E American, 28⅜" Inlet.
(Cont'd. top of next column)

For Sale

CENTRIFUGAL
15130 Maxon Prennix, 1¼" Inlet, ⅛ H.P. 3 PH.
5E Buffalo, 5¾" Outlet.
308-C11 North American. 1716-H.
5 Maxon "Premix," 1" Inlet, ¼ H.P. 1 phase.
308D 12 North American.
15052 Sturtevant, 3 H.P. 3 phase 60 cy. 220/440V.
1203 Spencer, 3 H.P. 3 phase 60 cy. 220/440V.
308D 13 N. American, 3 H.P. 3 ph. 60 cy.
1205 Spencer, 5 H.P. 3-60-220/440V.
1716G North American, 5 H.P. 3-60-220/440.
1005 Spencer, 5 H.P. 3-60-220/440.
1716H North American, 7½ H.P. 3-60-220/440.
1007 Spencer, 7½ H.P. 3-60-220/440.
12 oz. Mohr, 5 H.P. 3-60-220/440.
1716E North American, Gas Booster.
ED1B5 Allen Billmeyer, 30 H.P. 3-60-220 Sturtevant (1 AC. Cleaner Job).

MISCELLANEOUS
8D Rotoclone, 2 H.P. 3-60-220/440 Collector, Spencer Vacuum Cleaner.
Sturtevant Industrial Vacuum Cleaner.
Spray booth exhausters.

WM. W. MEYER & SONS
8309 NILES CENTER RD.
SKOKIE, ILL.

FOR SALE
The following foundry equipment is almost new—priced to sell!
2—Osborn Type 405-77 Molding Jolt Rollover and Pattern Draw—size 64" x 50" with runout car.
1—Osborn Type 2047 Molding Jolt Rollover and Draw—size 22½" x 21½".
1—Beardsley & Piper Sandslinger—Model BP 46—Stationary—7 to 10 CFM—Single Ram.
1—Newaygo Core Crusher—12" x 36"—10 ton per hr.
1—Dings Magnetic Separator—Type #12 B.N.—14" Belt.
All the listed equipment can be inspected at our warehouse and immediate shipment made.
GLOBE TRADING COMPANY
1815 Franklin St. Detroit 7, Michigan
Phone—Cadillac 8277

FOR SALE
1 Adams Universal Jolt Squeezer, side rod type, 10" piston, 32" between rods, pin lift, portable.
1 Adams Jolt Squeezer, side rod type 12" piston, 38" between rods, portable.
These machines purchased new in 1945 and used very little for 6 mos.; since lying idle. Condition like new. Price $500.00 each.
Florida Foundry & Pattern Works,
3737 N.W. 43rd St., Miami 37, Florida

CUPOLA FOR SALE
Used 72" cupola in good condition. Can be inspected at the plant.
THE JOHNSTON & JENNINGS CO.
877 ADDISON RD.
CLEVELAND 11, OHIO
TELEPHONE EN 0635

SAND BLAST ROOM
#5 Pangborn Room 8' x 10' complete with bucket elevator, dust arrestor. In absolutely first class condition. Has been used only about six weeks. Can be seen near Philadelphia. Price $4500.00 as is, where is.
S. R. VANDERBECK
731 Commercial Trust Bldg.,
Philadelphia 2, Penna. Phone Rittenhouse 6-9288

FOR SALE—GOOD USED EQUIPMENT
Sly Dust Collecting System, consisting of 3 Sly 62" Dust Filters, to handle 15,000 CFM each; motors 220/440 V, 3 ph, 60 cycle. Was erected but not used.
6 Ton Northern 46' span, 2 motor 230 volt DC Bridge Crane. Rope floor controlled.
60 HP Westinghouse, Type SK, compound wound, Motor, 230 volt DC, 680 RPM.
10 HP, P & H Ball Bearing Crane Motor, 230 volt, 675 RPM.
IRA C. JORDAN
2508 East Belleview Place
Milwaukee 11, Wisconsin

For Sale

FOR SALE
1—Johnson & Jennings #815 Jolt Rollover
1—Johnson & Jennings #682 Jolt Stripper
(These items have never been used)
1—Electric Motor—10 HP, 60 cycle, 220-440 volt, 3600 RPM with or without American Blower.
(Used but in good condition)
FRANTZ PATTERN & FOUNDRY CO.,
2201 E. ARTESIA ST.,
LONG BEACH, 5, CALIF.

FOR SALE
1—American type K 8 ft. sandcutter in good operating condition.
JAMESTOWN MALLEABLE IRON CORPORATION
JAMESTOWN, N. Y.

FOR SALE
1 Macleod "Doelcan" Sand Blast Barrel, Suction Type "N.C." Ready to run.
LANCASTER FOUNDRY CORPORATION
434 S. High St., Lancaster, Ohio

FOR SALE
American skip bucket loader in excellent condition. Address: Box 161, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE
#24-53" GARDNER vertical spindle motor driven horizontal grinder with built-in 20 H.P. 3/60/220-440 motor available immediately.
BOX 145
The FOUNDRY CLEVELAND 13, OHIO

FOR SALE
700 Tons 3⅛" Rounds, Lengths 10'10" to 12'6" having the following analysis: C .64 to .67—Phos. .012 to .019—Silicon .28 to .29—Chrome .43 to .44—Manganese 1.26 to 1.31—Sulphur .021 to .025—Nickel .52 to .53—Moly .11 to .12. Above material available for prompt shipment. If interested
WRITE — WIRE — PHONE
GLAZER STEEL CORPORATION
KNOXVILLE, TENNESSEE
2100 Ailor Avenue—Phone 4-8601

FOR SALE
4' x 6' Simplicity shake-out with special baffles, complete with one 5 H.P. type K.H. 1800 R.P.M. motor. Excellent condition, used very little. $1.000 for quick sale. Address: STANDARD FOUNDRY, CADILLAC, MICHIGAN.

FOR SALE
Machine shop tools released for private industry;—14" screw-cutting engine lathe $160. 16"-18"—$180. Quick change gear lathes $350-$550. Milling machines $240. 20" drill press $140. 4 ft. metal planer $320. 2 H.P. 3 phase motor $50. 3 H.P. $60. 36" band saw $180. Money back guarantee. Address: CONVERSION PARTS CO., 288 ADAMS ST., BOSTON 22, MASS.

FOR SALE
20—13" and 14" combination jolt squeeze strip molding machines, completely overhauled.
SUTTER PRODUCTS CO.
2005 WESTWOOD AVE. DEARBORN, MICH.

FOR SALE
No. 193-4 Milwaukee jolt, squeeze, strip moulding machine, new 1942.
No. 1N Simpson intensive mixer, new 1945.
MILES MACHINERY CO.
SAGINAW, MICH.

FOR SALE
3—Cleaning benches complete with type "D" #10 Rotoclones and fluorescent lighting, with Delco 5 HP 440/60/3 TEFC-BB motors. Address: PLANT EQUIPMENT CO., 946 BETTS ST., CINCINNATI 14, OHIO.

FOR SALE
Aluminum melting furnace—#10 AL Eclipse for 1000 BTU gas—16 oz. air furnace complete with reducing ring, drop ring and burners. Used one year and in good condition. One half price of new. Address: Box 147, The FOUNDRY, Cleveland 13, Ohio.

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It saves up to $36 daily

The BELL Prime Mover

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Bell Prime Movers combine the functions of giant wheelbarrows, half-ton platform trucks, and baby bulldozers . . . enable one man to do the work of four.

Here are just a few examples of how Bell Prime Movers pay for themselves in an amazingly short time. If other companies can make these savings, so can *your* company...

A Pennsylvania foundry reports saving 3 to 4 man-days per machine each day using Prime Movers to distribute core and facing sand; to handle residue from cleaning of cupola; for pouring concrete foundry floor. This is at least $36 daily in direct labor savings.

A New York State stainless-steel foundry reports using its Prime Mover for distributing approximately 20 tons of sand each day. One elderly man now does the job. This Prime Mover was purchased in November. By the end of January it had paid for itself in direct labor savings on this job alone.

Hundreds of other users report equally remarkable daily savings for each machine. If you would like some of these facts . . . as well as other important data about the Prime Mover . . . please write to us. We also can give you the names of nearby distributors who sell and service this machine.

A Few Features

- bucket holds 10 cubic feet . . . 18 with sideboards
- 50-inch scraper blade
- 9-square-foot platform body
- gear driven . . . no belts or chains
- clutch, engine, transmission fully enclosed . . . run in oil

A PRODUCT OF

BELL *Aircraft* CORPORATION

MAIL COUPON TODAY

BELL AIRCRAFT CORPORATION,
Post Office Box 1D-8, Buffalo 5, New York

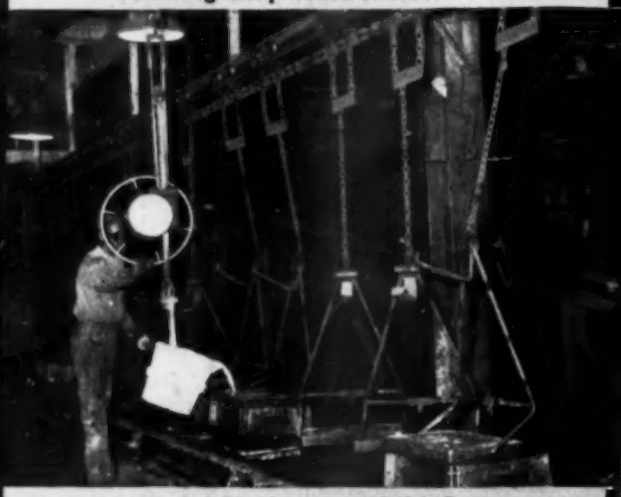
Please send me additional facts about the Bell Prime Mover.

Name..... *Address*.....

Company.....

City, Zone, and State.....

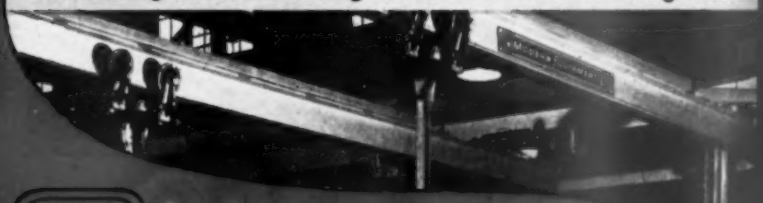
Pouring Snap-Flask Molds.



Pouring Malleable Iron on Mold Conveyor

Two-Up Pouring from adjacent cranes on individual runways. Easy transfer from crane to crane, via stationary cross-over, provides full floor coverage . . . circumventing such obstacles as building columns.

Pouring Ladles receiving metal from a Distributing Ladle.



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. . . engineered for Full Floor Coverage coupled with High-Efficiency, Low-Cost Pouring . . . are delivering Top Performance in hundreds of top flight foundries. Write for Descriptive Bulletins 142, 143 and 143-B, or ask your MODERN Representative.

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FORMULATED FOR Quality Casting Surface

Stevens

Dip **TRI-COTE** Brush

CORE WASH

Spray

PASTE TYPE CORE AND MOLD COATING

Stevens Research Laboratory, after years of research, has developed a new principle in Core and Mold Coatings—the "Ceramic Principle".

To show what happens to a Core and Mold Coating at elevated temperatures, a ceramic engineer made a series of cylinders out of Stevens Tri-Cote. Each cylinder measures 1½ inches in diameter and 1⅝ inches high and has a ¾ inch hole through the center.

The picture on the opposite side shows the series of cylinders. Each one was fired in an electric furnace and was held at the test temperature for 2 hours.

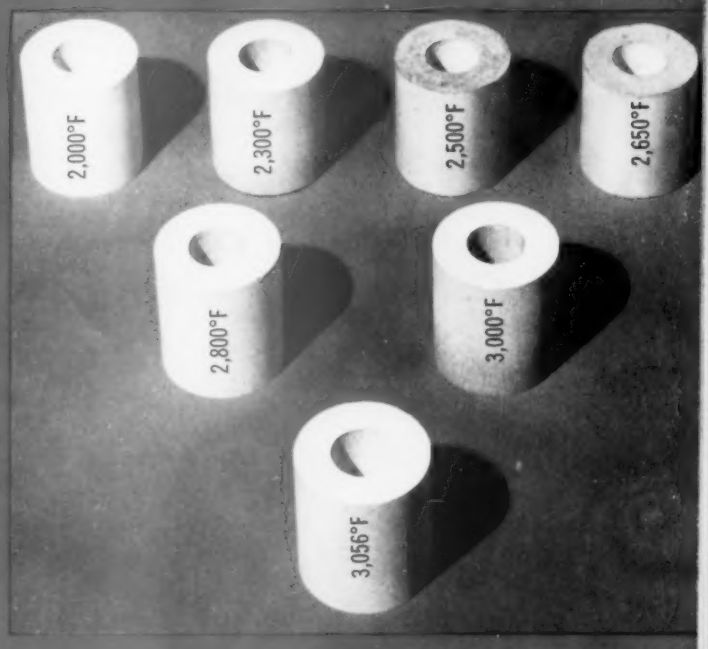
The cylinders fired at 2000°, 2300°, 2500°, 2650°, and 2800° F. showed no expansion, contraction or distortion. This means that up to some temperature above 2800° F. there would be no creeping, cracking, spalling or flaking off of the coating on core or mold. The cylinder fired at 3000° F. showed the start of incipient fusion. The cylinder fired at 3056° F. had zero porosity so this temperature was termed final fusion, although the cylinder held its shape after the 2 hour firing.

The "Ceramic Principle", as formulated in Stevens Tri-Cote, results in the coating on core or mold presenting a highly refractory wall to the hot metal, preventing metal penetration and sintering of sand to the casting surface.

Stevens Tri-Cote has many features besides its high fusion point. It has given outstanding results when used on cores and molds for grey iron, steel and non-ferrous. It applies equally well by dipping, spraying, brushing or swabbing. It stays in suspension so remarkably well that no agitation of the solution is necessary. It is ready for use immediately after mixing. It does not run or sag, but flattens out smoothly on all sand surfaces.

The name Stevens Tri-Cote and the identifying blue color are symbols of "The Ceramic Principle in Core and Mold Coatings".

Shipped in 850 lb. and 150 lb. Drums.



"The Ceramic Principle In Core and Mold Coatings"

FREDERIC B. STEVENS INCORPORATED

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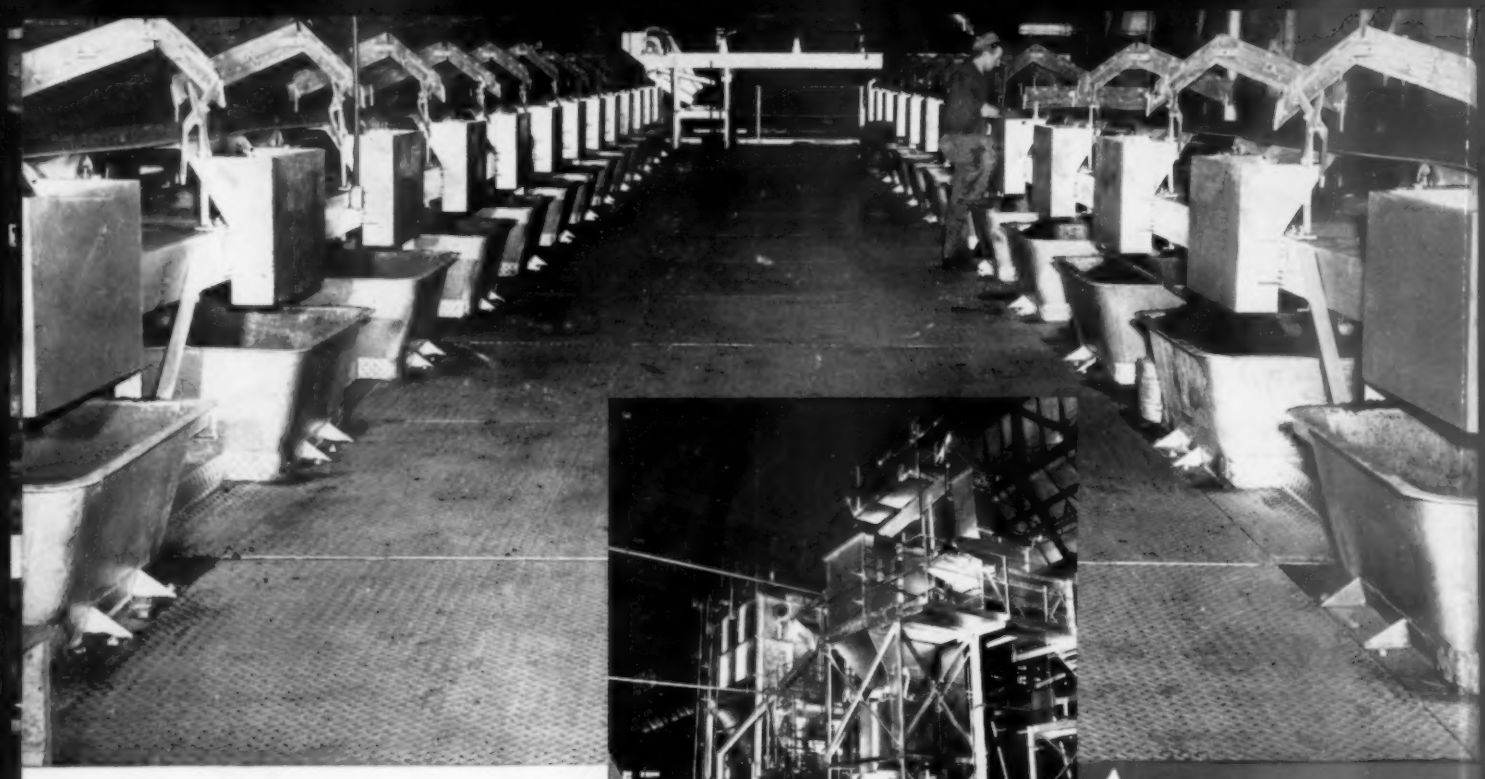

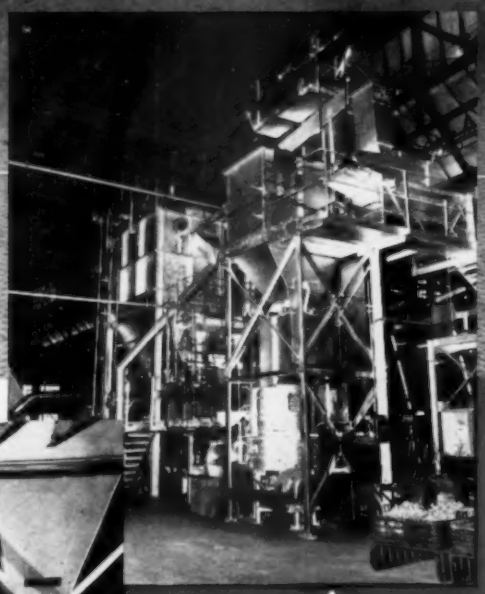

Photographs show (left) layout of molding stations, molders' hoppers and mold conveyors. Note wide gangway for core delivery; (above) two distributing belt conveyors with double discharge plows, serving two molding lines; and (center) general view of sand plant.

LINK-BELT Mechanizatio at Malleable Foundry Speeds Production for OHIO BRASS

Tru-Trac mold conveyor and oscillating conveyor featured

Better working conditions . . . higher production without increase in working area . . . lower costs . . . these are some of the advantages gained by Ohio Brass Company after modernizing their malleable iron foundry.

Molding sand is properly prepared in a Link-Belt double paddle mill. Sand is discharged to a bucket elevator, aerated, and brought to individual molders' hoppers at each molding machine by overhead distributing belt conveyors servicing two mold conveyor units. The molder, after making a mold, places it on the mold conveyor which conveys it past the pouring stations, where metal is poured into the molds. The mold conveyor continues to travel through the weight shifting zone and the enclosed and ventilated cooling zone where the mold is automatically discharged to the shakeout screens. The shakeout sand passing through the shakeout screen is conveyed by an oscillating conveyor and magnetic belt conveyor to the sand plant where it is reprocessed for molding use.

Why not get in touch with your nearest Link-Belt office for a discussion of your problems?

LINK-BELT COMPANY Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities. 11,173

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